



# CHEMICAL ABSTRACTS

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## 1—APPARATUS

C. G. DERICK

**A new form of precision hydrometer.** C. W. FOULK. *J. Optical Soc. Am.* 7, 327-34(1923).—The principle of the app. is that of submerged floating equil., in which an elongated hollow glass or silica bulb is ballasted so that it neither rises nor sinks in a given liquid. One type of app. consists of a tube open at both ends and of the right diam. to allow the float to move freely along its length, the appropriate scale being etched on the side wall of the tube. To the bottom of the float is attached a small chain hanging in a catenary curve between the float and an independent pt. of support. When the app. is put into a liquid the float takes up a position detd. by the d. of the liquid while the suspended chain automatically adjusts the wt. to that d. The effect of various const. of the above float on response to differences of liquid d. is shown by the equation:  $\Delta d = w[(D-d) \times \Delta b]/(2D \times V)$ , in which  $\Delta d$  = density change in liquid causing vertical displacement of float of  $\Delta b$  measured in cm.,  $D$  = density of chain material,  $d$  = density of liquid,  $V$  = vol. of float in cc. and  $w$  = wt. in g. of 1 cm. of chain. The formula shows the sensitiveness of the instrument to be proportional to the vol. of the float and inversely proportional to the wt. of a unit length of chain. Advantages over old types are: more accurate scale reading, absence of troublesome surface phenomena and uniform temp. Some disadvantages are given. HOWARD E. BATSFORD

**The improved MacMichael viscosimeter.** W. H. HERSCHEL. *J. Optical Soc. Am.* 7, 335-53(1923).—The app. is a const.-deflection, torsional instrument, with advantage of speed of operation, and weakness due to variations in torsional resistance of suspending wire. It consists of a torsional pendulum with a bob hanging in the liquid to be tested. On a turntable is an outer cup concentric with the cup holding the test liquid, and the space between contains oil or  $H_2O$  with an elec. resistance coil for heating. The turntable moves at const. speed and the pendulum has const. deflection during the test, due to the viscous drag of the liquid. The deflection is read on a horizontal dial concentric with the bob by means of a telescope, and the circumference is divided into 300 equal parts, called the MacMichael degrees. Two bobs are supplied, one similar to the disk formerly used and the other a cylinder 1 cm. in diam. and 4 cm. high. Various methods are described for avoiding end effects, including the use of guard rings on the inner suspended cylinder and trapping of an air bubble under the bob. Turbulence is caused by too wide a clearance and an equation is given for estg. the crit. velocity at which it begins. Imperfect elasticity of the torsional wire is the cause of considerable error and several tables are given showing allowable deflections and variation in torsional modulus of elasticity with diam. of wire. Tables and equations are also given to show the measurement of turning moments on the suspended wires, the variation of dial readings with change of viscosity and wire diam., and detn. of deflection by mirror and scale method. The conclusions reached are, that the wires of the improved MacMichael viscosimeter cannot be calibrated with  $H_2O$  because of turbulence, a liquid with viscosity of about 0.5 poise being required. The end effects are negligible compared to errors due to semi-permanent set of the torsion wires. The app. might be greatly improved by measuring the moment due to viscous drag by other means than the torsion wire. H. E. B.

**Viscosimeter.** E. STERN. *Chem.-Ztg.* 47, 291-2(1923).—The app. is useful in comparison work on colloids, such as varnishes, solns. of cellulose, rubber, adhesives, etc., as well as in the oil industry. It consists of 3 cylindrical glass bulbs, the middle one contg. 75 cc. between marks on the stems joining it to the others. The upper bulb is open at the top while the lower terminates in a tube to which capillary tubes of different lengths and diams. may be attached in order to change the rate of discharge. A  $H_2O$  jacket is provided for work at const. temp. J. H. MOORE

**A new measuring and circulating apparatus for the determination of water by means**

of xylene. AUFHÄUSER. *Z. angew. Chem.* **36**, 197(1923).—A modified Soxhlet extn. app. with a graduated section for measuring the collected  $H_2O$ . J. H. MOORE

Two fixed adjustable siphons. OTTO SCHMATOLLA. *Chem.-Ztg.* **47**, 292-3(1923); 1 cut. J. H. MOORE

Dust-removing apparatus. F. HOYER. *Z. angew. Chem.* **35**, 677-9(1923).—A general description of the operation of cyclone separators, and cloth filter chambers working under vacuum and pressure, for removing dust from the air in factories. J. H. MOORE

Jet dust counting apparatus. J. S. OWENS. *J. Ind. Hyg.* **4**, 522-34(1923); cf. *C. A.* **16**, 777.—Previous methods for estg. dust are reviewed. The development, construction and manipulation of the present instrument are described. During a London fog dust particles average over 20,000 per cc., with an av. diam. of 0.85 micron. In comparatively pure air on the Norfolk coast the number ranged from 100 to 200 per cc. Much space is given to the tech. examn. of the dust samples obtained by the app. L. W. RIGGS

Rapid weighing device. LLOYD BALDERSTON. *J. Am. Leather Chem. Assoc.* **18**, 188-9(1923).—Description of rider with vernier to be placed on the beam of an ordinary balance. J. A. WILSON

Apparatus for the  $\alpha$ -naphthol test for sucrose. G. L. SPENCER. *Ind. Eng. Chem.* **15**, 593(1923). E. J. C.

Portable acetylene generator. D. C. DUNCAN. U. S. 1,452,731, Apr. 24.

Flame-spreader and intensifier for alcohol burners. A. M. RAWLS. U. S. 1,453,519, May 1. The device is adapted for use with solidified alc. mixts.

Rotary drum filter. G. ENGEL, SR. U. S. 1,453,311, May 1.

Rotary horizontal drum drier. G. ENGEL, SR. U. S. 1,453,312, May 1.

Rotating drier. MASAHARU KAWAMURA. Japan. 40,856, Nov. 30, 1921. In the usual rotating drier used in the paper and textile industries, elec. heating has been substituted for steam heating.

Transferring apparatus for dried materials. SHIMATARO INAMURA. Japan. 40,791, Nov. 29, 1921. In a layered drying app., materials on a layer moving horizontally are transferred to a second lower layer without disturbing the arrangement of the material.

Filter for sugar solutions or other liquids. G. ENGEL, SR. U. S. 1,453,310, May 1. A filtering screen is mounted within an outer casing and an expansion joint is provided between the screen and casing at one end.

Apparatus for distilling glycerol or other liquids. W. E. SANGER. U. S. 1,452,617, Apr. 24.

Apparatus for pouring a definite quantity of liquid. TATSUHIKO ISHII. Japan. 41,062, Dec. 13, 1921. Diagrammatical.

Apparatus for charging water or other liquids with radium emanations. H. F. SAVOYE. U. S. 1,452,709, Apr. 24.

Measuring apparatus for X-rays. YOSHINAO KAWAKITA. Japan. 40,912, Dec. 1, 1921. Two plates painted with  $BaPt(CN)_6$  and a mixt. of a Ra compd. and  $ZnS$ , resp., are fixed in a tube side by side. X-rays to be measured are projected on the former and the emitted light and that from the latter are reflected by a mirror and their intensities are compared, by which the identity of the X-rays is measured. The intensity of the X-rays is regulated for comparison by metallic plates, the thickness of which is gradually changed.

Vacuum gage. CHOJI MATSUDA AND EIJI AOYAGI. Japan. 40,703, Nov. 18, 1921. A small coil made of Ag wire is suspended by a quartz thread. On the latter a small refracting mirror is attached and enclosed in a glass tube. A small thermocouple, made of Bi and Sb, is also enclosed under the coil and the whole tube is put between parts of a permanent magnet. The tube has a side tube for connection to a vessel to be evacuated. By supplying a definite radiant energy to the thermocouple from an elec. lamp or other suitable source, it is heated and the coil is rotated. The rotation is controlled by the pressure in the tube, so the degree of vacuum in the tube is measured by the angle of rotation.

Hydrometer. E. F. ANDREWS. U. S. 1,453,488, May 1. The pat. relates to structural features of a hydrometer and accompanying scales and indicator, for use in a storage battery.

Hardness-testing apparatus. H. MOORE and R. MATHER. U. S. 1,452,810, Apr. 24.

**Grinding machine.** KATARO KIHARA. Japan. 40,995, Dec. 6, 1921. A conical roll having an uneven surface is rotated in the center of a conical vessel, the inner surface of which is uneven. Another conical roll having an uneven surface is also rotated between the two.

**Crushing machine.** SEISHIN YASUNO. Japan. 41,128, Dec. 15, 1921. The motion of the crushing pestle is changeable according to the material to be crushed.

## 2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK

Leo Alexandrovitch Tschugaev (Chugaev). T. M. LOWRY. *J. Chem. Soc.* 123, 956-8(1923).—Obituary. E. H.

Frank Edwin Weston. P. J. FRYER. *J. Chem. Soc.* 123, 958-9(1923).—Obituary. E. H.

The Dschabir of the eighth and the so-called Geber (Pseudo-Geber) of the thirteenth century. E. O. VON LIPPMANN. *Chem.-Ztg.* 47, 321(1923). E. H.

Priestleyana. EDGAR F. SMITH. 15 pages.—An illustrated description of the relics of Joseph Priestley—books and app.—preserved in the library of the Univ. of Pennsylvania. JOSEPH S. HEPBURN

The importance of the work of van der Waals for chemistry. F. E. C. SCHEFFER. *Chem. Weekblad* 20, 222-5(1923).—A historic review is given of the work of van der Waals on phase equilibria. R. BEUTNER

Chemistry in medieval Islam. E. J. HOLMYARD. *Chemistry & Ind.* 42, 387-90(1923). E. H.

The third report of the German Atomic Weight Commission. M. BODENSTEIN, *et al.* *Z. angew. Chem.* 36, 221-3(1923). E. H.

Valency. WM. R. FIELDING. *Chem. News* 126, 177-81, 193-7, 209-14, 226-9(1923).—A general review under the heads: definitions, H as standard, methods of finding the valency, representation of valency, law of indestructibility of valencies, variability, variations with temp. and pressure, manifestations (at., mol., polymol., aggregation, cohesion and adhesion, soln.), when to compare valencies, periodicity, and theories (largely Werner's and modifications applied to the cobaltamines and related compds.). G. L. CLARK

The Röntgenometric methods for the determination of crystal structure. R. GROSS. *Fortschr. Mineral. Krist. Petr.* 7, 65-112(1922).—After a discussion of the phys. foundation for the methods, the Laue, Bragg, and Debye-Scherrer procedures for the X-ray analysis of crystal structure are described; a bibliography is included. E. F. HOLDEN

Survey of existing crystal structure data. RALPH W. G. WYCKOFF. *J. Frank. Inst.* 195, 349-65(1923); cf. *C. A.* 17, 1563.—Review concerning the crystal structure of sulfides, selenides, tellurides, halides, and cyanides. *Ibid* 531-52.—Review concerning the crystal structure of double halides and cyanides; nitrates, chlorates, bromates; carbonates; silicates; sulfates and related compds.; borates, aluminates and related compds.; org. compds. A wider view must be taken toward diffraction expts., seeing in no one method an answer to all questions and employing in each case that procedure which is calcd. to yield the most usable data. A bibliography of 151 references is given. JOSEPH S. HEPBURN

Crystal habit and temperature. H. SEIFERT. *Centr. Mineral. Geol.* 1923, 3-7.—S. gives the following exptl. data in support of the conclusion that temp. exerts a much more important influence on the velocity of growth of crystals in different crystallographic directions, and hence on crystal habit, than has usually been assigned to it in the past. Using NaClO<sub>3</sub> in aq. soln. and evap. quietly with temps. between 12° and 22°, it was found that the cubic habit has about 18% for its limiting temp., and at that temp., the following relationships apply for the velocities of displacement:  $v_{110} : v_{100} = \sqrt{2}$ ;  $v_{110} : v_{100} = 3/\sqrt{5}$ . From pure cubes in stirred solns. at 30°, combinations of these with the rhombic dodecahedron and pentagonal dodecahedron were obtained. P. Groth long ago, from cubic nuclei in solutions cooled to -8°, obtained tetragonal tristetrahedrons, or combinations of these faces with the tetrahedron, or tetrahedrons alone. At about 0°, combinations of the tetragonal tristetrahedron and cube were formed, representing an intermediate state between the above and the ordinary form. Other examples are given from the works of Groth, Loury, Barker, and Bakke. S. states that, in the light of these expts., the importance of Bravais' rule is greatly diminished and



J. J. P. Valetton's theory (*C. A.* 15, 983), as also that of P. Niggli (*C. A.* 14, 3354) are insufficient. Great gaps must be yet filled by systematic investigation, before the functional relationship of crystal forms to physical conditions can be established.

J. E. GILL

**The crystal structure of mercury.** L. W. MCKEEHAN AND P. P. CROFF. *Phys. Rev.* 19, 444-6(1922).—Hg, kept solid at  $-115^{\circ}$  in the vapor of boiling liquid air, was examd. by the powder method of X-ray analysis. A simple rhombohedral lattice with axial ratio 1.94 was indicated—the first of the elements to be so classified (Alsen and Aminoff found the regular hexagonal system). The d. calcd. from these data is 13.97, which is appreciably smaller than the values for solid Hg of Mallet, 14.193, and Dewar, 14.382. It is pointed out that the latter values were obtained from considerably more massive samples.

G. L. CLARK

**Investigations of uni-crystalline wires of tin.** H. MARK, M. POLANYI, AND E. SCHMID. *Naturwissenschaften* 11, 256(1923).—The structure of white Sn given by Bijl and Kolkmeier (cf. *C. A.* 12, 2533; Niggli, *C. A.* 16, 2073) is incorrect. Its lattice is ditetragonal with axes  $a = 5.83 \text{ \AA.}$ ,  $c = 3.16 \text{ \AA.}$  In the unit of structure there are atoms at the 8 corners and in the center of vol. and 1 atom on each vertical center line of the lateral faces. The most important glide directions and glide planes are [001], [011], [111] and (100), (110), resp. A Sn crystal elongated to a wire and heated at  $150^{\circ}$  for 3 min. is disrupted by recrystn., the latter beginning at the ends of the wire and growing at the rate of approx. 1 mm. per sec. The new crystal is so orientated with respect to the original that the width of the wire is not changed on elongation. If an extensible Sn crystal is fractured in liquid air in which only a low % elongation occurs, nonextensible fragments are formed.

C. C. DAVIS

**Uni-crystalline tungsten.** A. E. VAN ARKEL. *Physica* 3, 76-87(1923).—W crystals are produced by heating a W wire consisting of one crystallite in an atm. of supersatd.  $\text{WCl}_6$ . The W, thus obtained, is very soft and can be worked without any special treatment. By that treatment the single-crystal structure is lost, as proved by X-ray analysis, as well as by the fact that no single crystal could be found under conditions favoring growth after mech. treatment. At the same time, the X-ray analysis proved rigidly the single-crystal structure before the working. As the plane of cleavage proved to be the (100) plane, it is possible to explain why the mech. properties depend upon the orientation of the crystal axes.

R. BEUTNER

**The crystal structures of the system palladium-hydrogen.** L. W. MCKEEHAN. *Phys. Rev.* 21, 334-42(1923).—Fine wires or strips of Pd more or less satd. with H show upon X-ray examn. by the powder method 2 face-centered cubic at. arrangements: pure Pd with a parameter of  $3.900 \times 10^{-8} \text{ cm.}$ , and H-satd. Pd with a parameter between  $4.000$  and  $4.039 \times 10^{-8} \text{ cm.}$  depending upon the degree of satn. The value  $4.036 \times 10^{-8} \text{ cm.}$  probably corresponds to the compd.  $\text{Pd}_2\text{H}$ , with a d. of 10.76. (Yamada, *C. A.* 17, 1356, found no evidence of compd. formation.) The arrangement of the atoms may be as in  $\text{Cu}_2\text{O}$  but there is no X-ray evidence for the positions of the H atoms. A necessary condition for the occlusion of H by Pd is that there must be sufficient at. H supplied by electrolysis or by surface dissoc. of  $\text{H}_2$  at high temps. The penetration into the wire is relatively slow and into the strip irregular, depending on the orientation of the crystals. The crystal evidence provides an explanation of the variations of elec. resistance. A bibliography of 66 titles, mostly 1900-1921, is appended.

G. L. CLARK

**The significance of the experimentally determined crystal structures of the alkali polyhalides.** GEO. L. CLARK. *Proc. Nat. Acad. Sci.* 9, 117-22(1923).—The crystal structures of  $\text{CsI}_3$  (orthorhombic),  $\text{CsI}_2\text{Br}_2$  (orthorhombic),  $\text{KI}_3$  (monoclinic), and  $\text{CsICl}_2$  (rhombohedral hexagonal), of which the first 3 were detd. by C. and the last by Wyckoff, indicate for these trihalides and probably for all the others, since all are closely related crystallographically the same relative arrangement of the atoms. The 3 halogen atoms constituting the complex anionic group lie in a line with the heaviest at the center on the body diagonals of the unit parallelepiped contg. 1 mol. and thus constitute a singly acting unit in the solid lattice just as is true of the complex ions in soln. and just as the  $\text{NH}_4$  groups in hexammines are identified with the metal in crystals as they are in complex cations in soln. The relative stabilities of the polyhalides are directly related to the lattice dimensions therefore, other things being equal; Na atoms are not able to hold 3 halogen atoms in this kind of spatial distribution and the equil.  $\text{I}^- + \text{I}_2 \rightleftharpoons \text{I}_3^-$  is preponderantly to the left. If the unit parallelepiped of  $\text{CsI}_3$  has a diagonal along which lie 1 Cs and 3 I diameters, the at. radii of Cs and I are appreciably smaller than those found in simple halides, etc. This is taken to mean that a great compressing force parallel to the diagonal squeezes the atoms together in this direction, agreeing with the known properties, the conception of compressible atoms of T. W. Richards,

and with the non-additivity of at. radii. For the method of detg. the structures and the reflection of the characteristic spectra of Cs, I and Br. G. L. CLARK

**Röntgenometric observations on solid benzene.** B. BROOMÈ. *Physik. Z.* **24**, 124-30 (1923).—X-ray powder photographs were taken of  $C_6H_6$  crystals and found to show 35 lines. Though fair success is attained in relating the lines to the reflecting planes in a rhombic lattice calcd. from the crystallographic data, yet uncertainties as to the  $d$ , at  $-80^\circ$  (calc. 1.036) and the axial ratios render the detn. of the no. of mols. per unit crystal cell indeterminate. By an extrapolated  $d$  value and by changing the axial ratios given by Groth from  $a:b:c = 0.891:1:0.799$  to  $0.849:1:0.832$  the X-ray data agree fairly well with 4 mols. per unit cell and a value for  $c$  of  $6.852 \times 10^{-8}$  cm. Both the  $\beta$  and the  $\alpha$  lines from the Fe anticathode of the X-ray tube appeared in the photographs.

G. L. CLARK

**The production and properties of pure graphite.** M. PIRANI AND W. FESSE. *Z. Elektrochem.* **29**, 168-74 (1923).—Practically pure graphite filaments were prepd. with a core made of artificial silk (alkali cellulose xanthogenate). This core or base had a diam. of 0.015 to 0.02 mm. and was submitted to a 20-hr. carbonization in the presence of illuminating gas, the final temp. being  $500^\circ$ . Subsequently the filaments were heated in a C tube at temps. up to  $3000^\circ$ . The ash content after heating at  $2200^\circ$  was 0.36% (Al, Si and Ca oxides); after heating at  $3000^\circ$ , 0.07%. To remove the ash content altogether seemed almost impossible since all elec. furnaces have an appreciable pressure of Ca, Si and Al vapors. The filaments were then flashed at  $1500^\circ$  to  $2000^\circ$  in vapors of ligroin. The ash content of the flashed filaments was about 0.0003%. Next, the filaments were placed in a C tube and heated for 10 to 20 min. at  $3500^\circ$  in an atm. of CO. The product obtained was a practically pure graphite filament which responded to the characteristic graphitic acid tests. The microstructure revealed small laminated crystals (photo-micrographs are shown). X-rays showed the Debye-Scherrer graphite structure. Mechanically these graphite filaments were comparatively strong. They could be bent at sharp angles, coiled into spirals and straightened out again like filaments of lead. Upon cold rolling the filaments were elongated by 10%. The great flexibility of these graphite filaments is ascribed to the cylindrical arrangement or disposition of the graphite crystals around the filament axis. Tensile strength: 2 kg. per mm.<sup>2</sup>; Young's modulus, 836 kg./mm.<sup>2</sup> (vs. 11,000 for Cu); sp. gr., 2.23; sp. resistance 0.89 at  $20^\circ$  and 2.61 at  $2000^\circ$ ; Stefan-Boltzman equation exponent, 4.25; some of the properties of the graphite filaments resembled those of the purest grades of natural graphite. The heat cond. of the graphite filaments was better than that for Cu. Thermoelectrically, the graphite filaments were about midway between Pt and Pd; the reading was 0.25 millivolts against Pt, the current in the hot junction flowing from Pt to graphite.

C. G. F.

**The tensile strength of rock salt.** F. ZWICKY. *Physik. Z.* **24**, 131-7 (1923).—By a complex mathematical process the tensile strength or ionic tenacity is theoretically derived for NaCl. The numerical value in the direction of the principal axis comes out  $2 \times 10^{10}$  dynes/cm.<sup>2</sup>, as compared with the exptl. value of  $5.31 \times 10^7$  dynes/cm.<sup>2</sup>, confirming the discrepancy between theory and expt. previously observed by Polanyi (*C. A.* **16**, 2053). Consideration is given to the effects of the thermal motion of ions in the lattice as a cause of the much larger theoretical value which was derived upon the assumption that the ions are simply points in the lattice.

G. L. CLARK

**Density of molten silver.** R. HOFFMANN AND W. STAHL. *Metall u. Erz* **19**, 357-8 (1922).—The av. coeff. of expansion of Ag between  $t_1^\circ$  and  $t_2^\circ$ , the latter temp. being above the m. p., is given by the equation  $K = (V_2 - V_1)/(V_1 t_2 - V_2 t_1)$ , where  $V_1$  and  $V_2$  are the volumes of the same mass of Ag at  $t_1^\circ$  and  $t_2^\circ$ , resp. By using this relation and representing the sp. gr. of Ag at  $t_1^\circ$  and  $t_2^\circ$ , resp. by  $S_1$  and  $S_2$ , the sp. gr. of molten Ag at any temp. may be calcd. by means of the equation  $S_2 = S_1(1 + K t_1)/(1 + K t_2)$ . The values as obtained for 1000, 1025, and  $1050^\circ$  are 9.653, 9.633, and 9.613, resp.

J. S. C. I.

**Evaporation characteristics of tungsten.** G. R. FONDA. *Phys. Rev.* **21**, 343-7 (1923).—The rate of evapn. in vacuum is independent of the diam. of the W filament but is greater for fine-grained than for coarse-grained wires. In N the rate increases decidedly as the diam. decreases and the variation is in agreement with the Langmuir theory of heat conduction, which supposes that there is around the heated wire a stationary film of gas through which the evapd. atoms must diffuse. The rates for N and A are inversely proportional to the mol. wts.

G. R. FONDA

**Characteristic equation of isopentane.** MASAO KATAYAMA. *J. Chem. Soc. Japan* **43**, 609-29 (1922).—In the characteristic equation of the nearly ideal gas and liquid, a critical vol.,  $B$ , is considered to be 4 times that of the actual mol. vol., but should not

be considered to be equal to  $b$  at the abs. zero. When a liquid at abs. zero assumes the perfect isotropic amorphous solid state, which K considers to be equil. condition of isotropic crystals, with the mols. in contact with each other,  $B$  must become equal to  $2.565b$ . 3 figures are given to show each possible relationship between total vol. and actual vol. of spheres, from which the above values are calcd. On this basis, the following equations are developed,  $P = RT \{1/(V-b) + 1.565b/(V-b)^2\} - P_i$ ;  $L = RT \{ \ln[(V_g-b)/(V_l-b)] + 1.565b \{1/(V_l-b) - 1/(V_g-b)\} \}$  where  $L$  is heat of evapn.,  $P_i$  internal pressure,  $V_g$  and  $V_l$  are vols. of the gas and liquid at the normal pressure. The value of  $L$  obtained by this equation is identical with that exptly. observed. Also,  $b$  obtained by the above calcn. is identical with the vol. at zero calcd. by extrapolation according to the linear diam. law. of Cailletet and Mathias, and is  $1/3.826$  of the crit. vol. If  $P_i$  is a function of the vol., then  $P = RT \{1/(V-b) + 1.565b/(V-b)^2\} - a/V^2 + \gamma/V^3 - \delta/V^4$ , which, although it is a 6th degree equation, will become similar to that of van der Waals when  $V$  is greater than  $b$ . A const.-temp. curve obtained by calcn. from various constns. based on natures of a crit. point of isopentane at its crit. temp. is identical with the crit. const.-temp. curve obtained by actual measurement (max. error  $\pm 3.5\%$ ). The temp. coeff. of pressure at const. vol., calcd. from the above equation, also agrees with the one observed. Around the crit. temp., K.'s equation gives results similar to those obtained by Berthelot's equation for nearly ideal gases.

S. T.

The meaning of "a" and "b" in the equation of state. A. F. CORE. *Phil. Mag.* 45, 622-4 (1923).—C. raises an objection to the "a" calcd. by Fowler (C. A. 16, 2625) being considered as corresponding to van der Waals' "a". The interpretation of the  $RTb/v$  and  $a/v$  terms in van der Waals' equation is discussed regarding certain assumptions as to the nature of the mol.

S. C. L.

A new modification of Dühring's relation. D. B. KEYES. *Ind. Eng. Chem.* 15, 525-6 (1923).—Dühring's relation between temp. and vapor pressure is modified to a relation between temp. and mol. vapor concn.:  $T'_A - T_A = (T'_A/T'_B)(T'_B - T_B)$ , where  $T'_A$  = any temp. of the liquid,  $T'_B$  = temp. at which a known compd. has the same mol. vapor concn. as the liquid has at  $T$ ,  $T_A$  and  $T_B$  = any other temps. at which the 2 compds. have the same mol. vapor concn.

C. C. DAVIS

The reaction consequent upon the evaporation of a liquid and upon the emission of vapors from small orifices. W. G. DUFFIELD. *Phil. Mag.* 45, 641-88 (1923).—Expts. with the elec. arc (*Phil. Trans. Roy. Soc. Assoc.* 1919, 109; and C. A. 14, 3358) showed that the poles behave as though a mech. pressure were acting to force them apart. The most likely explanation appeared to be the evapn. of C atoms from the hot poles. To det. whether the evapn. of ordinary liquid is accompanied by such a pressure, the present expts. were undertaken. The results show that when a liquid is made to boil or evap. rapidly on one arm of a balance into air, no such counter pressure as predicted is to be observed; but when the evapn. takes place into a vacuum a large counter pressure is observed of about the calcd. magnitude. An explanation of the observation in air is sought in an interference process between the vapor mols. issuing from the liquid and the opposing air mols. A theory is advanced that the vapor mols. upwardly directed stop an equal no. of air mols. coming in the opposite direction and prevent their exerting a pressure upon the liquid which is just equal to that which the vapor mols. exerted on leaving the surface and hence there is no unbalanced pressure produced, as in *vacuo*. Direct evidence of such an interference was found by a torsion method of discharging a rapid stream of vapor through variable-sized small orifices into water. The phenomena of boiling and evapn. are also dealt with. In boiling far more mols. are projected into the vapor phase through interchange at the bubble wall than by actual bursting of bubbles.

S. C. LIND

Precision measurement of the composition of the constant-boiling mixture of hydrochloric acid and water. C. W. FOULK AND M. HOLLINGSWORTH. *J. Am. Chem. Soc.* 45, 1220-8 (1923).—The content of HCl in the const.-boiling mixt., measured with the precision of at. wt. detns. is 20.245% when distn. is carried out at 750 mm. pressure. The rate of distn. affects the compn. to a small extent. H. JERMAIN CREIGHTON

The flow of liquids into capillary tubes. C. H. BOSANQUET. *Phil. Mag.* [6] 45, 525-31 (1923).—The motion of a liquid flowing into a horizontal evacuated capillary under const. head is examd. and an expression is obtained which is rigorous if Poiseuille's law holds. The equations are extended to the case of two fluids in contact and an approx. soln. is obtained. Similar formulas are deduced for the cases of a liquid flowing into an inclined tube. Comparisons are made with the formulas of Washburn (*Phys. Rev.* 17, 273 (1921)) and of Rideal (C. A. 17, 910).

S. C. L.

The displacement of the isoelectric point of gelatin by formaldehyde. OTTO

GERNGROSS AND ST. BACH. *Collegium* 1922, 350-1.—The isoelec. point of gelatin as detd. in 0.5% soln. after passage of the elec. current for 2 hrs. was 4.75. A  $pH$  value of 4.3 was obtained after the addn. of 10%  $CH_3O$ . C. T. WHITE

Adsorption of carbon monoxide. A. PIVETTI. *Rend. accad. sci. Napoli* 28, 91 (1922); *Giorn. chim. ind. applicata* 5, 70-3 (1923).—P. has measured the efficiency of various substances in adsorbing CO by passing a known vol. of CO over the substance and measuring the residual gases. The substances used together with the relative vols. of CO adsorbed by a like weight (100 g.) of the adsorbing media are oak C 590, dry hemoglobin 600, dry CuCl mixed with pumice 740, CuCl plus wet pumice 1600, CuCl-( $NH_4$ ), walnut charcoal soaked in  $NH_4$  and dried 3000; CuCl, pine charcoal, and soda lime 3140, CuCl, pine charcoal, plus pumice, sprinkled with soda lime 3960.

Sorption of iodine by carbons prepared from carbohydrates. J. B. FIRTH. *J. Chem. Soc.* 123, 323-7 (1923); cf. *C. A.* 16, 2803.—The activity of carbons prepd. from different carbohydrates has been found to vary over a large range, the greatest activity being displayed by C prepd. from glucose and the least by that from levulose. All the carbons prepd. have the same ultimate sorptive capacity.

Surface and boundary junction properties of soap solutions. J. F. CARRIÈRE. *Chem. Weekblad.* 20, 206-9 (1923).—The surface of neutral soap solns. is supposed to be composed of fatty acid mols., oriented according to the theory of Harkins and Langmuir. This assumption, which is opposed to the view of Walker (*C. A.* 16, 371), proved to be correct by the following expt.: moving camphor particles upon  $H_2O$  are stopped by adding some drops of Na oleate which decrease the surface tension to about 55 dynes per sq. cm. If some drops of dil. NaOH soln. are added the camphor particles again start moving. This is explained by the disappearance of the free fatty acid mols. owing to a restraining of the hydrolysis of the soap. Soap solns. behave like solns. of higher fatty acids, as regards their surface properties, in that a higher soly. should be ascribed to these acids than they actually possess. Such hypothetical fatty acid solns. are to be approached very closely if aq. AcOH is used as a solvent, instead of  $H_2O$ . If  $H_2O$  is added to a soln. of fatty acids in pure AcOH, just to such a degree that a sepn. does not yet take place, the soln. will foam considerably. Such a soln. would correspond to a soap soln. as regards the state of soln. of the fatty acid mols. If slightly more ( $H_2O$ ) is added the soln. splits into 2 phases by pptn. of the acid and the foaming stops immediately. An analogous expt. can be performed with a Na oleate soln.: by adding an excess of oleic acid the soap soln. splits into 2 phases and the foaming immediately stops. (This expt. must be done at elevated temps. to prevent gelation.) Free fatty acids mols. are present, also, at the junction of a soap soln. and a liquid, immiscible with  $H_2O$ , e. g., any kind of oil. Because of the soly. of the fatty acids in the oil, these mols. are, however, driven into the oil. The surface tension is, therefore, subject to irregular changes, an equil. being reached very slowly. Most measurements of surface tension in the older literature have, for this reason, little value except in those cases in which pure neutral oil and pure  $H_2O$  are used when the equil. is reached rapidly. Substances with capillary activity accumulate in the surface exclusively in monomol. layers, being oriented according to the theory of Harkins and Langmuir, and the surface tension is proportional to the square of the av. distance of the directed mols. in the surface. The proof is based on measurements of Miss Pockels, who detd. the minimal surfaces over which 1 mg. oleic acid, and 1 mg. triolein may spread without diminishing the surface tension of  $H_2O$ ; the surface occupied by one mol. triolein can be calcd. from these detns., as well as from the surface occupied by oleic acid on the basis of the above assumption. The values obtained agree closely, which is to be considered as a good proof for the above assumption.

Viscosity, neutralization and isomorphism. L. J. SIMON. *Compt. rend.* 176, 437-40 (1923).—The viscosity curves obtained during partial neutralization of  $H_3AsO_4$  and  $H_3PO_4$  with NaOH and KOH show distinct minima. The curves for neutralization of  $H_3AsO_4$  and  $H_3PO_4$  with NaOH nearly coincide, and give rise to the theory that at equimol. concns., and a fixed temp., isomorphous substances affect the viscosity of aq. solns. in the same manner. The chlorides of Na, K, Rb, and  $NH_4$  were compared in the same manner, and the figures for the last 3 isomorphous chlorides are similar, while NaCl shows a distinct difference.

A simple form of apparatus for observing the rate of reaction between gases and liquids and its use in determining the rate of solution of oxygen by water under different conditions of mixing. H. G. BECKER. *Phil. Mag.* [6] 45, 581-92 (1923).—See *C. A.* 16, 363.

T. S. CARSWELL

S. C. L.

**Relation between surface tension and density.** D. B. MACCLEOD. *Trans. Faraday Society*, 1923, (advance proof).—The magnitude of the surface tension of a liquid is a function of the distance between the mols., and is therefore dependent on the d. The empirical relation  $\gamma/(\rho_l - \rho_v)^{1/2} = C$ , where  $\gamma$  is the surface tension,  $\rho_l$  and  $\rho_v$  are the densities of liquid and vapor, resp., and  $C$  is a const. for each liquid, has been found to fit the exptl. figures between the m. p. and crit. temp. Tables are given for AcOEt, Et<sub>2</sub>O, benzene, CCl<sub>4</sub>, Me formate, PhCl and Hg, at various temps. between the above limits. In the case of associated liquids such as EtOH and AcOH, the agreement is not so satisfactory. For the sp. cohesion of a liquid  $\alpha^2$ , the relation  $\alpha^2 = 2C(\rho_l - \rho_v)^{1/2}$ , where  $C$  has the same value as above, is derived. The original equation suggests that the surface tension of a liquid under pressure should be proportional to the 4th power of the density. No exptl. data are available on this. ROGER G. FRANKLIN

**Liquid chlorine as an ionizing solvent.** J. MENNIE AND D. MCINTOSH. *Trans. Roy. Soc. Can.* 16, Sect. III, 301-5(1922).—No inorg. nor ordinary org. substances were found which ionized in this solvent. Et<sub>2</sub>O, EtOH, (Me)<sub>2</sub>CO, and AcOEt form conducting solns. when HCl is added. The conduction is due to the ionization of an oxonium acid compd. by the acid. Compds. of the general type O-compd.-halogen-halogen acid could not be prepd. Some well crystd. products proved to be mixts. of previously investigated oxonium halogen and oxonium acids compds. A. T. CAMERON

**Solubility of cyclohexane in liquid sulfur dioxide.** W. F. SEYER AND V. DUNBAR. *Trans. Roy. Soc. Canada* 16, 307-10(1922).—The curves show no evidence of any compd. formation. A. T. CAMERON

**Densities of dilute solutions of potassium salts and the volume changes occurring on solution.** H. HARTLEY AND W. H. BARRETT. *J. Chem. Soc.* 123, 398-401(1923).—Very accurate measurements of the ds. of dil. aq. solns. of KCl, KBr, KI, KClO<sub>3</sub>, KBrO<sub>3</sub>, KIO<sub>3</sub> and KNO<sub>3</sub> have been made at 18°. It is shown that with a pycnometer of about 25 cc. capacity and a counterpoise with a vol. equal to the sum of the vols. of the glass of the pycnometer and its liquid content when filled to the mark. the ds. of dil. aq. solns. can be detd. without difficulty with an accuracy of 2 or 3 units in the 6th decimal place. The ds. are calcd. from the expression,  $d_s = d_w[(W_3 - W_1 + \Delta_1 V_p)/(W_3 - W_1 + \Delta_1 V_p)]$ , where  $d_s$  and  $d_w$  are the ds. of the soln. and of H<sub>2</sub>O, resp. (referred to H<sub>2</sub>O at 4° as unity),  $W_1$ ,  $W_2$  and  $W_3$  are the apparent wts. in air of the pycnometer empty and filled with H<sub>2</sub>O and soln., resp.;  $\Delta_1$  is the d. of air at the time of weighing; and  $V_p$  is the vol. of the liquid which fills the pycnometer to the mark. The total change in vol. which occurs during the process of soln. has been calcd. for each soln. The contraction (in cc.) on soln. of one g.-mol. of the salts at infinite diln. at 18° is as follows: KCl = 12.3, KBr = 10.7, KI = 8.8, KClO<sub>3</sub> = 8.1, KBrO<sub>3</sub> = 7.8, KIO<sub>3</sub> = 2.4, KNO<sub>3</sub> = 9.7. H. JERMAIN CREIGHTON

**Abnormal osmosis through collodion membranes.** G. PREUNER AND O. RÖDER. *Z. Elektrochem.* 29, 54-64(1923).—When a collodion membrane separates a concd. (inner) and a dil. (outer) salt soln., the p. d. due to the diffusion of the salt drives the charged liquid from the dil. to the concd. soln., thus giving rise to abnormal osmosis. Since the diffusion p. d. between the 2 membrane surfaces depends on the fall of concn. within the membrane, the abnormal osmosis occurring with stationary membranes differs from that taking place with rotating membranes. In the 1st case, with stagnant solns., the concn. at the surface of the membrane in the dil. soln. is much greater than in other parts of this soln. The ratio of the concns. on the 2 sides of the membrane increases as the concn. of the inner soln. increases. This ratio attains a max. value at a concn. for which the electroosmosis, and therefore the electro-kinetic adsorption potential,  $\zeta$ , has a max. value. This behavior is explained on the assumption that the diffusion coeff. of the salt has a min. value at this concn. This is in accordance with the fact that the diffusion potential differences are much greater with a membrane than without. The electrolyte behaves towards the membrane as though the migration velocity of the anion were decreased, the decrease being greater the larger the value of  $\zeta$ . With rotating membranes the concns. at the surfaces of the membrane differ but slightly from the concns. in the other parts of the solns. The diffusion potential differences increase as the concn. of the inner soln. increases. For this reason, and also on account of increased pure osmotic effects, a max. does not occur for the transference of the liquid. H. JERMAIN CREIGHTON

**Anomalous osmose of solutions of electrolytes with collodion membranes. II. Effect of pore diameter.** F. E. BARTELL AND D. C. CARPENTER. *J. Phys. Chem.* 27, 252-69(1923); cf. C. A. 17, 1572.—The character and variety of the exptl. results prevent a detailed report. The results of the research tend to show that the structure of

the colloid gel is that of a somewhat irregular network having a mesh of the order 0.5 to 1.0 microns. It is evident that the phenomenon of anomalous osmose and the attending salt diffusion is dependent upon the pore diam. of the membrane.

C. R. PARK

**The speed of chemical reactions through a solid.** C. D. NIVEN. *Chem. News* 126, 183-6(1923).—The relative times required for a reaction to proceed through a solid when placed in a reacting soln. or liquid are mathematically derived for plane plates of thickness  $2a$ , a circular cylinder of radius  $a$ , and a sphere of radius  $a$ . The relative times are, resp., 0.5:0.2276:0.1271, no matter what the reacting chemical is nor of what strength. Plates and cylinders of casein in formaldehyde gave results in agreement with the theory.

G. L. CLARK

**Nature of solid solutions.** E. C. BAIN. *Chem. Met. Eng.* 28, 576(1923).—A correction (*C. A.* 17, 1940). The curve showing the relation between the dimensions of the unit cube and the at. compn. is a straight line.

F. P. FLAGG

**The lowest temperature yet obtained.** H. KAMERLINGH ONNES. *Trans. Faraday Soc.* 18, 145-74(1922).—A detailed account of expts. aiming to produce the lowest possible temp. by the use of liquid He. Expts. are described which deal with the lowering of the known limit of its liquid condition. Improvements in the appliances for research in the region of He temps. are described and illustrated. Sepn. of cryostat and liquefier is accompanied by an improvement in the latter which leads to a more rapid prepn. of liquid He and a more economical use of liquid H. Detn. of temp. is effected by use of the van der Waals law of corresponding states as a guide in extrapolating the law connecting temp. and vapor pressure to lower temps. than those for which it was established exptly. The lowest temp. yet attained is some hundredths of a degree below  $0.9^{\circ}$  K.

W. H. BOYNTON

**High-temperature investigation.** E. F. NORTHRUP. *J. Franklin Inst.* 195, 685-86(1923).—A comprehensive account is given of the methods and technic used in the study of matter at high temp. free from chem. contamination, with special reference to the high-frequency induction furnace.

JOSEPH S. HEPBURN

**Temperature measurement with the Einthoven galvanometer.** F. ADCOCK AND E. H. WALLS. *Phil. Mag.* 45, 532-60(1923).—A Pt resistance thermometer is used in connection with an Einthoven galvanometer to measure rapid fluctuations of temp. such as those of the gas-engine cylinder. The object is to test the thermometer to see with what speed and accuracy it is capable of following known changes in temp. produced by moving it rapidly within a silica tube the upper part of which is electrically heated while the lower part is cooled by a water-jacket. The app. together with the elec. circuits is described in detail. The theory of the unbalanced Wheatstone bridge is treated and its application to the resistance thermometer. Several series of exptl. results are reported showing the temp. lags for different diameters of Pt wire and with various other factors varied. It is concluded that at atm. pressure and with quiescent air the Pt resistance thermometer is not capable of following with sufficient accuracy temp. changes which take place with the rapidity of a gas-engine cycle.

S. C. LIND

**The specific heat and heat of wetting of dextrin.** SPROCKHOFF. *Z. Spiritusind.* 45, 217(1922).—Detns. of sp. heat of roasted  $H_2O$ -free yellow dextrin (I) and of white dextrin contg.  $1\frac{1}{2}\%$   $H_2O$  (II) were made. Petroleum, sp. heat 0.55 to 0.645, which takes up heat, was used in place of  $H_2O$ . The sp. heat was computed according to the formula of Kohlrausch:  $C = [w(x - t)/m(T - x)]c$ , where  $C$  represents sp. heat of dextrin,  $w$  the wt. of petroleum in g.,  $t$  the temp. of petroleum before addn.,  $m$  the wt. of dextrin in g.,  $T$  the temp. of dextrin,  $x$  the temp. of the mixt. and  $c$  the sp. heat of petroleum.  $C$  was found to be 0.3555 for I and 0.363 for II. The heat of wetting was detd. by adding I to water, and also by adding water to a suspension of I in petroleum. The following formula was used to det. heat of wetting of the former:  $Cal = [n(x - t) + m.C(x - t_1)]/m$ , and for the latter:  $Cal = [n(x - t) + (w.c + m.c)(x - t_1)]/m$ .  $Cal$  represents heat of wetting for 1 g. of  $H_2O$ -free dextrin,  $n$  wt. of  $H_2O$  in g.,  $t$  the temp. of  $H_2O$ ,  $t_1$  the temp. of dextrin or dextrin-petroleum suspension,  $m$  the wt. of dextrin in g.,  $w$  the wt. of petroleum in g.,  $x$  the temp. of the mixt.,  $C$  the sp. heat of dextrin and  $c$  the sp. heat of petroleum. The av. heat of wetting was found to be 16.5 cal. for 1 g.  $H_2O$ -free dextrin, and 16.2 for the suspension. The sp. heat of starch contg. 18%  $H_2O$  was found to be 0.47. The heat of wetting decreases as the water content increases.

C. N. F.

**Estimation of the dissociation of liquid intermetallic compounds.** Sign of the heat of mixing of liquid copper and antimony. F. SAUERWALD. *Z. Elektrochem.* 29, 85-7(1923).—The lowest values for the dissociation of a no. of intermetallic compds.

have been detd. from the isotherms of the sp. vol. of alloys which contain a chem. compd. The following values (lowest) for the degree of dissocn. in % by wt. have been obtained:

	700°.	800°.	900°.	1000°.	1100°.	1200°.
Cu <sub>3</sub> Sn			23%	20%	17%	16%
Cu <sub>3</sub> Sb			50	46	41	37
Cu <sub>3</sub> Sb <sub>2</sub>			53	51	46	36
Cu <sub>2</sub> Al					28	19
Cu <sub>2</sub> Zn <sub>3</sub>			0?	10?		
Sb <sub>2</sub> Zn <sub>3</sub>	38?	35?				

The data do not indicate the nature of the sign of the heat of mixing of liquid Cu and Sb.

H. JERMAIN CREIGHTON

**Tables of thermodynamic properties of ammonia.** ANON. Bur. Standards, *Circ.* No. 142, 47 pp.(1923).—The fundamental units used in the tables are defined and the empirical equations used in computing the tables are given. The data are given in tables convenient for use in *refrigerating engineering* and also in a *Mollier chart*.

E. H.

**Thermodynamics and statistical mechanics.** R. H. FOWLER. *Phil. Mag.* [6] 45, 497-516(1923).—In previous papers (Darwin and Fowler, 16, 4102; 17, 18; Fowler 17, 1183) the laws of mol. equil. have been statistically developed without resort to thermodynamics. In the present paper the laws of thermodynamics are deduced from the theory of statistical equil. Following a summary of previous results the following topics are dealt with: the entropy of an assembly in dissociative equil. for various types of reactions, the use of the characteristic function, the usual introduction of entropy into statistical mechanics and the "increasing property" of entropy, a proof of the increasing property, Nernst's heat theorem and the chem. const. Nernst's theorem is equiv. to the statement that the wts. of the lowest quantum states must be equal.

S. C. L.

**Systems chromium trioxide-nitric acid-water.** S. A. MUMFORD AND L. F. GILBERT. *J. Chem. Soc.* 123, 471-5(1923).—The soly. isotherms of this system have been detd. at 25° and 45°. The system is of a comparatively simple character, the compn. of the solid phase being CrO<sub>3</sub> throughout. The 2 isotherms are precisely similar in type; they exhibit no discontinuity, and differ only in the slightly greater solys. of CrO<sub>3</sub> at the higher temps. The minimum soly. of the anhydride occurs in approx. 18 N. HNO<sub>3</sub>, which strength of acid corresponds with the mol. ratio HNO<sub>3</sub>:H<sub>2</sub>O. When this minimum is reached, subsequent increase in soly. of CrO<sub>3</sub> does not take effect until after the ratio 2HNO<sub>3</sub>:H<sub>2</sub>O has been passed. It appears, therefore, that hydration of the acid may play an important part in detg. the soly. relations in the system.

H. JERMAIN CREIGHTON

**Determination of the length of the dipole of hydrogen chloride molecules by means of electrostriction experiments.** O. E. FRIVOLD AND ODD HASSEL. *Physik. Z.* 24, 82-6(1923).—The length of the dipole of the HCl mol. is detd. to be  $0.31 \times 10^{-18}$  cm. Falkenhagen (*C. A.* 16, 1890), by measuring the dielec. const., found  $0.45 \times 10^{-18}$  cm. The sepn. of the nuclei of the HCl mol. is  $1.265 \times 10^{-8}$  cm. These values are based on classical considerations. It was hoped that these expts. would make it possible to det. whether the classical formula,  $(3\epsilon - 1)/(4\pi\epsilon + 2) = \mu^2 N/(3kT)$ , where  $\epsilon$  is the dielec. const.,  $\mu$  the moment of the dipole,  $k$  the Boltzmann const., and  $N$  the no. of mols. per cm.<sup>3</sup>, or Pauli's formula, which is based on the quantum theory and has the factor 1.54 instead of  $1/3$ , in the above, is preferable. However, since either formula gives a value for the length of the dipole which is less than the sepn. of the nuclei, and thus of the right order of magnitude, these expts. do not establish a preference.

R. H. LOMBARD

**Hydrogen-chlorine chains.** F. FOERSTER, A. NOBIS AND H. STÖTZER. *Z. Elektrochem.* 29, 64-79(1923).—Currents of the order of  $10^{-2}$  amp./sq. cm. can be produced without much polarization by means of the cell (Pt)H<sub>2</sub>|HCl|Cl<sub>2</sub>(Pt), provided it is divided into 2 parts by means of a diaphragm. The electromotive behavior is due to the formation of HCl, which, owing to the difference in the transport nos. of the H<sup>+</sup> and Cl<sup>-</sup> ions, concentrates more rapidly in the Cl than in the H section. Under special conditions the potential between the poles increases with rise in temp., up to a temp. which is higher the greater the current taken from the cell. Above 80°, however, the potential falls even though the discharge current is high, because the decrease in the electromotive reactions of the gases in decreased concn. exceeds the increase due to rise in temp. The electromotive reaction velocity of Cl is very high and is independent of the nature of the electrode materials (Pt or different kinds of C). On the other hand, a high elec-

tromotive reaction velocity of H is associated with catalytic action of the Pt; but this velocity is not so large as to prevent considerable polarization at high current densities. The electromotive action of the H is largely confined to a thin layer of electrolyte covering the surface of the electrode adjacent to the gaseous space. To increase this surface of contact as much as possible and to maintain the H concn. necessary for the production of current, a brisk current of H must be bubbled through the electrolyte when the discharge current is large. C cannot be used as a carrier for the Pt black. At a smooth Pt electrode the electromotive action of H is sluggish, while at C electrodes of various kinds H does not exert any electromotive action. This behavior is in accord with the high overvoltage of H at C electrodes. Chains such as  $H_2[C][HCl][C]Cl_2$  or  $H_2[smooth Pt][HCl][C]Cl_2$  only develop such e. m. fs. as arise from the concn. chain  $Cl_2$  (of very small partial pressure)  $[HCl]Cl_2$  (at 1 atm. pressure). When the process  $H_2 \rightarrow 2H^+ + 2\ominus$  is no longer able to take place at a platinized electrode, it is polarized at + 0.8 to 0.9 v., and the process  $Pt \rightarrow Pt^{++} + 4\ominus$  then proceeds until all of the Pt black has been consumed. Cells have been prepd. which yield 0.5 amp. for many hours with a mean e. m. f. of 0.75 v. These cells are constructed with comb-shaped electrode plates and contain 300 cc. of electrolyte in each section. The H is passed through the cell at the rate of 10 l. per hr. With 30 l. of H per hr. the current is increased to 0.63 amp. In such cells as high as 0.1 N HCl is produced in the Cl section.

H. JERMAIN CREIGHTON

**Experiments on the sign of the electric charge assumed by a metal immersed in a liquid.** R. D. KLEMAN AND WM. FREDERICKSON. *Phys. Rev.* 19, 409 (1923).—Fine metal wires were suspended in a liquid by a fiber 2 m. long, a current was sent through the liquid, and the direction of the deflection of the wire noted through a microscope. In distd.  $H_2O$ , Cu, W, Ag, Mo, Mg, Al, C, Ni, Au, Pt, Sn and Zn assume a negative charge and Bi, Pb, Fe and Cd a positive charge. Colloidal Bi, Pb, Fe, Ag, Pt and Au act no differently than the wires of these metals.

G. L. CLARK

**Electrical properties of flint glass of density 6.01.** G. L. ADDENBROOK. *Phil. Mag.* 45, 516-25 (1923).—Hopkinson (*Trans. Roy. Soc. London* 1878) announced that the ratio  $K/D$  is approx. const. for all glasses over a range from  $D = 2.87$  to 4.5, where  $D$  is density and  $K$  is the dielec. const. A. employs a glass of approx. compn.:  $SiO_2$  22%,  $PbO$  78%, and d. 6.01. Fragments were used employing the method of mixts. Details of the elec. method and the calcn. are given. The very high dielec. const. 13 was obtained, giving a  $K/D$  value that fits in well with those of Hopkinson. The ratio  $K/N^2$  ( $N$  is the index of refraction of the  $D$  line) is 3.55, the highest ever found for any normal substance. The evidence indicates that the glass is a true compd.,  $PbSiO_3$  dissolved in an excess of  $SiO_2$ , and not merely a mixt. of  $SiO_2$  and  $PbO$ .

S. C. LIND

**Significance of the electrode potential.** JAROSLAV HEYROVSKY. *Proc. Roy. Soc. (London)* 102A, 628-40 (1923); cf. Beketoff, *J. Russ. Chem. Soc.* 20, 525-33 (1888).—By means of an imaginary thermodynamic process, a modification of the Nernst equation is developed. A further equation  $A = E - I' + M$  is developed, where  $A$  is the chem. affinity of the metal to the metalloid,  $E$  is the electron affinity of the metalloid to the electron,  $I'$  is the work necessary to ionize the metal, and  $M$  the work necessary to ionize the mol. into its ions in the gaseous state. From these two equations is obtained the final equation  $B + K = 1.7 \log_{10} m - E. P.$ , where  $B$  is the, so-called, basicity,  $m$  the equiv. wt. of the metal, and  $E. P.$  the electrode potential. It is pointed out that the order of the normal electrode potentials does not correspond to the true order of the basicities of the metal oxides, whereas the quantity  $B$  calcd. from the equation gives a proper sequence. It may be stated qualitatively that the hydroxide of the metal is the more basic the more negative (positive according to American usage) is the  $E. P.$  of the metal, and the heavier is its equiv. wt. Special attention is drawn to the influence of the equiv. wt. Various electrode processes are discussed on the basis of this principle. The "absolute zero potential" value derived from electrocapillary phenomena is shown to be erroneous.

C. R. PARK

**Action of gelatin upon concentration cells.** RENE AUDUBERT. *Compt. rend.* 176, 338-40 (1923).—The effect of addn. of gelatin upon the e. m. f. has been studied for concn. cells of the type:  $AgI-AgNO_3$ ;  $AgCl-AgNO_3$ ;  $Ag_2S-AgNO_3$ . The change in the voltage indicated that the concn. of the Ag ion was lowered in the compartment to which the gelatin was added. The concn. relations may be expressed by the equation  $C - C' = AC'p$  where  $C$  and  $C'$  are the apparent concns. before and after addition of gelatin, and  $A$  and  $p$  are consts. The value of  $p$  was found to be  $1/2$ . It is probable that the apparent reduction in concn. is due to the adsorption of  $Ag^+$  ions by the colloidal particles of gelatin.

C. R. PARK



**The molecular scattering and extinction of light in liquids and the determination of the Avogadro constant.** C. V. RAMAN AND K. SESHAGIRI RAO. *Phil. Mag.* **45**, 625-39(1923); cf. *C. A.* **17**, 1372.—The intensity of the light diffused in liquids is not given by the Rayleigh law of scattering. The theory of fluctuations of density of Einstein and Smoluchowski gives a quant. explanation, if mol. anisotropy is taken into account. The light scattered transversely by liquids is very imperfectly polarized, far more so than by the vapor of the same substance. This is explained by considering the general characteristics of the distribution in the liquids of the mols. separately as regards position and orientation. The theory may be given quant. form from which the polarization in the liquid can be calcd. from that in the vapor. Good agreement with expts. is observed for some liquids, but only qual. in others. In accord with the theory, intensity of scattering increases with the temp. in liquids and becomes very large on approaching the crit. point. Polarization tends to become more perfect. The state of polarization of the scattered light is found exptly. in liquids to be a function of the incident wave length, which indicates that the observed optical anisotropy is probably connected with the resonance frequencies of the mols. in different directions and with the dispersion properties of the substance. The abs. detn. of the light scattering in liquids enables the evaluation of the Avogadro const. S. C. LIND

**Optical rotation and atomic dimension.** D. H. BRAUNS. *Physica* **3**, 69-75(1923).—On comparing the optical rotation of some acetyl derivs. of glucose, viz.: chloroaceto-glucose, bromoaceto-glucose, iodoaceto-glucose and fluoroaceto-glucose, and the corresponding derivs. of cellose and xylose, B. finds that the differences:  $[F] - [Cl]$ ,  $[Cl] - [Br]$ , and  $[Br] - [I]$  are very nearly proportional to the differences in at. diams. found by Bragg. This shows that the at. dimensions form an additive element in the rotation. It is remarkable that this simple relation does not hold for the mol. but for the sp. rotation. R. BEUTNER

**Hydrogen-ion concentration.** A. V. HILL. *Nature* **111**, 434-6(1923).—An elementary discussion with explanations of the meaning of  $p_H$ , and of buffer action, and with certain biol. applications. A. E. STEARN

The constitution of the silicates (TAMMANN) **6**. Metallurgical applications of physical chemistry (DÖSCH) **9**. Electromotive behavior of some binary alloys (KREMAN, *et al.*) **9**.

### 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**Atomic projectiles and their properties.** ERNEST RUTHERFORD. *Engineering* **115**, 242-3, 264-6, 306-8, 338-41, 358-9(1923).—A series of popular lectures covering mostly the work of R. and his students. F. O. A.

**Some properties of resonance radiation and excited atoms.** K. T. COMPTON. *Phil. Mag.* **45**, 750-60(1923).—A speculative discussion pointing out certain properties of resonance radiation and calling attention to their bearing on the existence of atoms in various excited states. It is shown (1) that the passage of resonance radiation through a gas may be treated as a problem in diffusion, (2) that the no. and persistence of excited atoms depends jointly on the av. time of activation  $\tau$  of an atom and the square of the scattering coeff.  $\alpha^2$  of the resonance radiation in the gas and may be calcd., and (3) that the presence of impurities may affect expts. on the properties of resonance radiation by transforming it into other wave lengths to which the gas is more transparent. S. C. LIND

**The new element hafnium.** D. COSTER AND G. HEVESY. *Chemistry and Industry* **42**, 258(1923); cf. *C. A.* **17**, 1356, 1751, 1922. —The chem. properties of Hf lie closer to those of Zr than Th. High m. p., high power of light emission from the oxide, and electron emission from the heated metal are all shown by Hf. Hf is abundant enough for industrial use; its proportion in the earth's crust is estd. as  $> 2 \times 10^{-4}$ . NORRIS F. HALL

**The influence of the atomic nucleus upon valence, orientation and the induced polarity of atoms.** HERBERT HENSTOCK. *Chem. News* **126**, 129-35(1923).—In order to explain the underlying cause of the hypothesis of induced polarity of atoms as developed by Lapworth (*C. A.* **16**, 2047-8) an easily rotated nucleus is assumed. The nucleus is thought by Lewis and Langmuir to be a sphere with two positive poles with an inner layer of electrons. In a compd. the octet is probably more or less fixed but the nucleus may be rotated  $90^\circ$  (will the rotation of the nucleus inside the static octet allow a re-

conciliation between the Bohr and Lewis atoms?). In a compd. the presence of the nucleus in one position in the key atom will cause an orientation of nuclei of successive atoms at  $90^\circ$  so that there is an induced polarity of the opposite sign on, alternate atoms. A similar explanation helps in understanding the action of mol. H, Cl etc. See also Kermack and Robinson (*C. A.* 16, 2633), and Lapworth and Shoosmith (*C. A.* 16, 3078).

F. O. ANDEREGG

**Magnetism and atomic structure.** O. VON AUERS. *Umschau* 27, 225-8 (1923).—A short review of modern theories with reference to recent exptl. work connecting at. structure and magnetism.

F. O. ANDEREGG

**The question of the subelectron.** LUDWIG SCHILLER. *Z. Physik* 14, 6-13 (1923).—The assumption of oblate particles of av. axis ratios of 1:1:10 when used with the Stokes-Cunningham equation will give a mean for Bär's results (*C. A.* 16, 3586) very close to the accepted value. B.'s assumption of unusual densities is not necessary. Cf. Bär and Yang, *C. A.* 17, 1375, and Regener, *C. A.* 17, 1376.

F. O. ANDEREGG

**The helium atom model.** H. A. KREMERS. *Z. Physik* 13, 292-341 (1923).—The most accepted model of the He atom has two single-quantum orbits inclined to each other at an angle. When mech. laws are applied to this the energy of ionization is calcd. to be 3.9 v. greater than the exptl. value. Moreover such a system is shown to be unstable in the mech. sense. But the indefiniteness of the subject is so great that one must not condemn this model in favor of which so many arguments may be advanced. The usual conclusion that He has no resultant impulse moment because it is not paramagnetic is not conclusive in view of the fact that the Richardson-Einstein-de Haas effect and the anomalous Zeeman effect establish the insufficiency of the classical electrodynamics for a complete description of the magnetic properties of the atoms. The problem is still unsolved.

F. O. ANDEREGG

**The (suggested) formation of helium and neon in discharge tubes containing hydrogen.** A. PIUTTI AND E. BOGGIO-LERA. *Mem. Accad. Lincei* [v] 13, 687-701 (1921).—Full details of work a summary of which has already appeared (cf. Piutti, *C. A.* 17, 674, and also Piutti and Cardoso, *C. A.* 14, 2884; Baly, *Annual Reports on the Progress of Chemistry* 1914, 45; 1920, 29, 30).

J. C. S.

**The normal orbits of the valency electrons of the alkali metals.** A. TH. VAN URK. *Z. Physik* 13, 268-74 (1923).—A speculative mathematical paper. The equations for the normal orbits of the valence electrons of the alkali metals given by Schroedinger (*C. A.* 15, 2247) are modified. With the aid of the simple assumption that a valency electron in its elliptical orbit passes from an outer field of force with effective nuclear charge unity through a spherical shell of discontinuity charge  $Z' - 1$  into a field of force where the effective nuclear charge is  $Z'$ , for the quantum numbers of these orbits for the alkali metals the same numbers can be obtained as obtained by Bohr. For Li and Na the quantity  $\Delta$ , which represents the deviation of the sum of the quantum numbers  $n + n'$  from the quantum number  $n^*$ , resulting from the assumed structure, is in fair agreement with the observed values of  $\Delta$  for various values of  $n'$ .

L. B. LOEB

**Radioactive minerals of Sardinia.** E. PUXEDDU AND A. MARINI. *Ann. chim. applicata* 7, 34-7 (1923).—Investigations similar to those of Francesconi (cf. *Gazz. chim. ital.* 47, 1 (1917); *C. A.* 13, 811) and Serra (cf. *C. A.* 12, 1018) were made on other Sardinian minerals. Chrysocolla from Bena de Padru was variable in compn., the outer part contg. approx. 40% Cu and little Fe and the inner over 60% Cu and much Fe (cf. *Atti accad. Lincei* 12, 81 (1903); 13, 43 (1904)). Treated with aqua regia approx. 0.5 by wt. was sol., and contd. Cu, Pb, Fe, Al, and Ca. Sepd. by ordinary methods, the  $H_2S$  and  $NH_4OH$  ppts. were radioactive. The residue insol. in aqua regia, chiefly  $SiO_2$ , was not radioactive. Limonite and its gang, vanadinite and stolzite from Bena de Padru were also radioactive, though less so than those above. That minerals of dissimilar compn., not usually radioactive, were all found to be radioactive from a definite locality indicates that their activity is due to a diffusion of radioactive  $H_2O$  or vapors from great depths. Molybdenites from Sarroch and from Bonnos were not radioactive. Tourmalines from Caprera and from Asinara were radioactive. Blende from Gonnos, its residue insol. in aqua regia, and the 3rd and 4th group of metals isolated, were all active. Pyromorphite from the Crabalazzu vein, Gennamari Ingurtosu, contd. Pb, Al, Ca, Mg, Na, HCl and  $H_3PO_4$  and was radioactive. Pyromorphite from Rialzu, Gennamari Ingurtosu, was likewise active.

C. C. DAVIS

**Uranium V.** A. PECCARD AND E. STAHL. *Physik. Z.* 24, 80-1 (1923); cf. *C. A.* 16, 2068.—The half life of U V is corrected to 34 days and a table is given showing that the decay of U X is in accord with the assumption of U V being present to the extent of 14%.

MARIE FARNSWORTH

**Some  $\alpha$ -ray tracks.** C. T. R. WILSON. *Proc. Cambridge Phil. Soc.* **21**, 405-9 (1923).—Enlargements are given of 3 stereoscopic photographs of  $\alpha$ -ray tracks from  $\text{ThO}_2$  obtained by the cloud-track method in an elec. field. When an  $\alpha$ -ray passes before expansion the ions are sepd. in the field according to their mobilities, giving a means not only of counting the ions formed but also for measuring their mobilities. Th emits an  $\alpha$ -particle and the Th A resulting has about twice the mobility of ordinary ions, suggesting less attraction for moisture. In a fraction of a second Th A emits another  $\alpha$ -particle. The first part of its cloud track is forked because the first  $\alpha$ -particle had used up the excess moisture and the ions formed by the second must migrate in the elec. field to regions of more moisture to become fixed. The straight track of a fast  $\beta$ -particle is shown and the very curved path of a slow one near the end of its path. Recoil atoms give enlarged heads to the  $\alpha$ -tracks. Along the first part of these tracks are small side tracks of the secondary  $\beta$ -particles or  $\delta$ -rays of Bumstead (*C. A.* **11**, 752). Their range suggests a speed double that of the  $\alpha$ -particles. They have no special forward velocity component; this suggests that they come from the K level of the atom. Some of the first of the  $\delta$ -tracks end in globular cloudlets which suggest the ejection of short range  $\beta$ -particles from gas mols. by K-radiations ( $\delta$ ), confirming Kapitza's (*C. A.* **17**, 360) explanation of greater loss of energy by  $\alpha$ -rays per electron ejected during the first part of their range.

F. O. ANDEREGG

**Theoretical considerations concerning the deflection of slowly moving free electrons by atoms.** FRIEDRICH HUND. *Z. Physik* **13**, 241-63 (1923).—Recent expts. of Mayer, Ramsauer, and Townsend have shown that in A and some other gases the mean free paths of electrons become abnormally great as the electron velocity becomes rather small. In A the values reach 15 times the value expected from the kinetic theory. The only explanation possible is that at these low speeds the electrons can wander through the atoms undeflected. Since such behavior seems completely at variance with the laws of classical dynamics, H. after an exhaustive analysis arrives at the following explanation. When an electron collides with an atom there results a certain probability that owing to the atomic field of force the electron will drop from its initial rectilinear path to another rectilinear path with less energy. The difference of energy between the two paths is converted to radiation, the max. energy radiated being given by  $h\nu = \frac{1}{2}mv^2$ , where  $\frac{1}{2}mv^2$  is the initial kinetic energy of the electron and  $\nu$  the frequency radiation. The probability of such an energy transition is governed by the rule that for no frequency radiated can the intensity be greater than that demanded by the classical radiation laws. Calcn. shows that for decreasing electron velocities the probability of such a transition rapidly becomes small compared to unity. Thus the majority of the slower electrons will pass through the atoms with no loss of energy. Accordingly the long free paths at low velocities are explained if it is assumed that the electrons which suffer no transition from one orbit to another, i. e., no loss of energy, will pass through the atoms undeflected. This assumed behavior is obviously incompatible with the laws of electrostatics. It is not incompatible with the applications of these laws to the Bohr atom.

L. B. LOEB

**An application of the electron theory to the Hall effect.** J. A. ELDREDGE. *Phys. Rev.* **21**, 131-42 (1923).—If the free path of the electron instead of the free time of motion is assumed to be independent of the velocity, the Hall effect is zero in an isotropic conductor. No Hall effect was detected in Hg. By slight modifications in the assumptions either positive or negative coeffs. might be obtained. In a crystal with asymmetry of free paths one direction may give a positive coeff. and another direction a negative coeff. The distribution of free paths relative to elec. and magnetic fields is very important. Most metals having negative coeffs. are face centered while those having a positive coeff. are body centered or hexagonal. The equation of Lorentz for sp. cond. is derived from these assumptions and it is shown that the electrons with velocities parallel to the elec. field do not take part in the cond. In a crystal the cond. should and does depend upon the direction of the field with respect to the crystal axes.

F. O. ANDEREGG

**The ionization of potassium vapor by light.** R. C. WILLIAMSON. *Phys. Rev.* **21**, 107-21 (1923).—Light from a Hg-vapor lamp was allowed to fall through a series of calibrated light filters onto a jet of K vapor at a pressure of  $10^{-4}$  mm. The formation of positive ions began at about  $\lambda 3000$  Å. in agreement with the value calcd. from the ionization potential (2856 Å.). About 1 atom in  $10^6$  per sec. was ionized but the no. increased with decreasing wave length of the incident light. Photoelec. emission occurred from the solid K up at 4500 Å. and increased below 3000 Å. It is suggested that the difference between the photoelec. effect and formation of positive ions is due to the presence of impurities on the solid K.

F. O. ANDEREGG

**Cold and hot electron discharges.** W. SCHOTTKY. *Z. Physik* **14**, 63-106 (1923).—

A series of phenomena involving the expulsion of electrons from metals is considered in terms of the old Richardson conception of the work involved in expelling an electron in the presence of an electrostatic surface field, together with the assumption of the existence of electrons in the metal in the condition of an ideal gas. The max. surface field for the removal of an electron from a metal is  $10^8$ – $10^9$  v./cm. A theory is developed connecting spontaneous thermionic emission with cold emission in a very strong field. At submicroscopic irregularities on the surface the field strength is about ten times as great as would be calcd. from the contour detd. microscopically. The expts. of Lilienfeld on autoelectronic discharge and cathode X-rays (*C. A.* 15, 3930; 16, 1181) are discussed as well as the work of Rother (*C. A.* 16, 925) and Hoffmann (*C. A.* 15, 2384) on electronic action from minute points. The mechanism of certain classes of crystal detector is explained on the assumption of certain points having very large and suddenly reached work of expulsion. Exptl. results are in agreement with this qual. view. For surfaces about  $10^{-8}$  cm. apart there is a critical voltage of about 1 v. below which no conduction takes place. Conduction is supposed to take place from or between points. On this basis a theory of the *mechanism of the microphone* is discussed. The resistance of a submicroscopic point of contact is about  $10^7$  ohm for C and about  $10^8$  ohm for Pt. Then with a plausible assumption as to the number of contact points the unsuitability of good conductors for microphones is readily understandable. The distinction between the mechanism of the detector and the microphone is considered and the existence of an at. cushion of nonconducting material as a necessary condition for the detector action is assumed. The whole theory is discussed and explained on the standpoint of modern at. and quantum theories.

F. O. ANDREBGG

**Critical electron energies in helium and the extreme ultra-violet spectrum.** ANN C. DAVIES. *Phil. Mag.* 45, 786–97(1923); cf. *C. A.* 16, 2262.—In view of the fact that there is a difference of 0.7 v. between the value of the ionization voltage for electrons in He deduced from the extreme ultra-violet observations of Lyman and the exptl. value of Horton and Davies (*C. A.* 16, 681) and of Franck and Knipping, the possible sources of the discrepancy are discussed. The discovery that there are 2 crit. radiation voltages in the region of the first point of inelastic impact sepd. by only 0.8 v. suggests the possibility that an error of interpretation has been made resulting in values being attributed to all the crit. voltages in He which are too high by 0.8 v. Evidence is deduced that the Bohr selection principle, that only those transitions occur which involve a change of 1 unit in the azimuthal quantum no., cannot hold rigorously for transition to the normal state in He. A possible explanation is given of the absence of certain lines indicated by the current-voltage expts. from Lyman's plates, and the question of the ability of the current-voltage method to reveal the existence of the ultra-violet series lines is discussed. The method may be expected to indicate the first lines of a series involving the return of an electron to the normal orbit, but not the higher members of the series.

S. C. LIND

**Does an accelerated electron necessarily radiate energy on the classical theory?** G. A. SCHOTT. *Phil. Mag.* 45, 769–77(1923).—S. concludes that the hyperbolic motion of the electron previously considered (*C. A.* 15, 1652) does not contravert the conservation of energy provided it be generated in any way consistent with conservation of its elec. charge and the continuity of velocity. The only class of electronic motions unaffected by radiation is where the path of the electron is an hyperbola with a const. component velocity parallel to the conjugate axis. The hyperbolic motion of Born is a special case in which the transverse velocity is zero. In these motions the radiation is entirely at the expense of the acceleration energy of the electron.

S. C. L.

**Testing the expressions for the longitudinal and transverse masses of the electron.** L. T. JONES AND L. C. POMEROY. *Phil. Mag.* 45, 760–8(1923).

S. C. L.

**Electron emission from metals under the action of high electric fields.** G. HOFFMANN. *Physik Z.* 24, 109–11(1923).—This is a brief review of investigations by H. and by F. Rother (*C. A.* 10, 15), the latter's results being interpreted rather as a study of the properties of a poorly conducting layer. The expts. of H. establish that when the field strength between metals in vacuum increases, a current begins to flow after the potential reaches a value characteristic for the metal, e. g.,  $4 \times 10^6$  v./cm. for Pt. This is explained as a removal of negative electricity from the metal. Some of the exptl. difficulties and inconsistencies are discussed.

W. F. MCGGERS

**Secondary electron emission from copper and copper oxide surfaces.** L. E. MCALISTER. *Phys. Rev.* 21, 122–30(1923).—Electrons from a Wehnelt cathode were accelerated through two grids onto a Cu plate, all concentric. The no. of secondary primary electrons increased with the acceleration rapidly up to 300 v. but more slowly beyond. The surface of the Cu where struck by electrons became gradually oxidized,

resulting in an increase in secondary emission; this may be due to the increase in electrons at the surface with the addn. of O. On reduction, the values for secondary emission approached those for the original Cu. The emission was independent of the temp. up to 450°. Some evidence is given of the existence of secondary electrons of about the same speed as the primary electrons. The ionization potential of Cu was found to be about 6 v. On oxidation it was raised above 10 v.

F. O. ANDEREGG

**Notes on X-ray scattering and J radiation.** C. G. BARKLA AND RHODA R. C. SALE. *Phil. Mag.* 45, 737-50 (1923).—The objects of the investigation are (1) to see whether in the scattering of X-radiation any change in character of the scattered radiation could be detected and (2) to exam. the existence of J radiation for the lighter elements. The expts. show that even H, C and O (together) exhibit a very slight increase of scattering with wave length. Over a considerable range of wave length the outstanding feature of the scattering is the constancy of the scattering coeff. compared with absorption and other coeffs. In Al and more so in Cu, the scattering increases more rapidly with wave length. Over a considerable range no difference between the absorption coeffs. of the primary radiation and of the X-radiation (scattered) from paper was detected. No evidence of J characteristic radiation was found. A further report will be made.

S. C. LIND

**The normal cathode drop in the glow discharge.** R. SEELIGER. *Jahrb. Radioakt. Elektronik* 19, 222-52 (1923).—A very careful discussion is given of the expts. carried out by others and the present status of the theory of the cathode drop is given. The normal cathode drop is the smallest potential between the cathode and the border between the dark space and the negative glow. When the base of the discharge does not completely cover the cathode it is const. for a given gas and a given cathode metal. This drop varies (1) inversely with the photoelec. activity of the metal, (2) with the position of the metal in the periodic table according to modern at. theories, (3) with the electron affinity of the gas, (4) with the nature of the surface film of gas on the metal. The cathode drop is proportional to the length of the dark space and inversely to the current density (except in O). Artificial methods of lowering the cathode drop are discussed. Little is known about the course of the cathode drop but at the axis of the tube it is probably linear. The shadow expts. of Meyer and Schüler (*C. A.* 13, 1416) lead to important conclusions: Electrons are actually generated at the cathode surface and other ions are formed at the end of the dark space. Aston's dark space is discussed and the importance of the fringe between the dark space and the negative glow is pointed out. The theories of Stark, of Holm (*C. A.* 13, 3072) and of Skinner (*Phys. Rev.* 4, 5, (1915)) are criticized and those of Holm are considered to have the soundest elements for the foundation of the correct mechanism of the cathode drop.

F. O. ANDEREGG

**The cathode and anode drop in mercury, zinc, cadmium and magnesium vacuum arcs.** H. SCHÜLER. *Z. Physik* 14, 32-43 (1923).—Cold anodes were placed in the negative glow so that no positive column was visible. From the total potential drop so measured the values of Hertz, *et al.* (*Ann. Physik* 18, 213 (1905)) were subtracted to give the anode drop. At low current strengths the anode drop falls off but at higher strengths it is const. This const. range depends upon the vapor used. It is supposed that the arcs are caused by double collisions and the corresponding orbits after the first collision are calc'd.

F. O. ANDEREGG

**The photoelectric sensitivity of palladium-silver alloys, containing dissolved hydrogen.** F. KRÜGER AND A. EHMAR. *Z. Physik* 14, 1-5 (1923).—An app. was made up with a rotating sector on which were placed distinct pieces of the alloys all of the same surface and differing from one another in compn. in steps of 10%. Each could thereby be subjected in turn to radiation from a quartz Hg-vapor lamp. When sat'd. with H by first heating to 160-80° and then cooling to room temp., their photoelec. effect was found to have a max. value for 40% Ag, which was about 3-fold greater than for pure Pd and 12-fold greater than for Ag. The soly. of H<sub>2</sub> shows a similar curve with a max. also at 40% Ag. These results are confirming evidence for the influence of dissolved H in increasing the photoelec. effect.

G. R. FONDA

**L series of tungsten and platinum.** J. S. ROGERS. *Proc. Cambridge Phil. Soc.* 21, 430-3 (1923).—Numerous new lines in the L-spectra of W and Pt are recorded which confirm and supplement the conclusions of Dauvilliers (*C. A.* 16, 2071) for this series among the heavier elements.

F. O. ANDEREGG

**The K absorption limits of some elements.** J. CABRERA. *Compt. rend.* 176, 740-1 (1923).—In spite of the large no. of measurements already made on the K absorption limit of X-rays, it was thought of interest to make a series of systematic measurements for the rare earths, since the data for these are scarce. The materials were furnished by Urbain and the rotating crystal-spectrograph and method of de Broglie

(C. A. 12, 2066) were employed with a Coolidge tube having an anticathode of W or Pt. The wave lengths of the K absorption limits are given to 4 significant figures for 16 chem. elements from La to Ta, *i. e.*, for at. numbers 57 to 73 both inclusive, but not including 61 (unknown element). W. F. MEGGERS

**The luminescence of tungsten anodes.** MARIN KATALINIC. *Z. Physik* 14, 14-8 (1923).—A faint and continuous luminescence appears about a W anode in concd.  $\text{H}_2\text{SO}_4$  at voltages of 60 and higher at which the film of  $\text{WO}_3$  and  $\text{W}_2\text{O}_7$  found at lower voltages is converted into a film of  $\text{WO}_3$ . Simultaneously the current is greatly reduced. The luminescence is of the same nature as that observed by oxidation in the air of the pyrophoric  $\text{WO}_3$ . Among other solns. studied, no luminescence occurs in 30%  $\text{NaOH}$ , where the oxide film is at once dissolved. C. R. FONDA

**Phosphorescent boric acid.** ERICH TIERDE AND A. RAGOSS. *Ber.* 56B, 655-66 (1923); cf. C. A. 16, 2078.—Both  $\text{H}_3\text{BO}_3$  and completely anhyd.  $\text{B}_2\text{O}_3$  can be activated by org. compds. but phosphorescence is generally weaker than that of the partially dehydrated acid.  $\text{H}_3\text{BO}_3$  crystd. from water or org. solvents in presence of the activating substance, terephthalic acid with water, phthalic anhydride with acetone, shows marked phosphorescence and is completely stable in air. From the great similarity to the effects observed by Kowalsky in solid  $\text{EtOH}$  it is concluded that phosphorescence is due to internal strains caused by pressure. By dehydrating activated  $\text{H}_3\text{BO}_3$  slowly at  $200^\circ$  in vacuum over  $\text{P}_2\text{O}_5$  a slightly sintered material is obtained, anhyd. by analysis, which phosphoresces well although less than partially dehydrated acid. About 50 org. compds. have been examd. for activating properties. These include hydrocarbons, phenols and quinones, amines, acids, sulfonic acids, halogen derivs., nitro derivs., dyes, etc. Results with each are tabulated. Br, I and  $\text{NO}_2$  groups prevent phosphorescence; Cl greatly shortens its duration. Evidence is presented that the org. mol. is sole carrier of the light effect, that its nucleus remains unchanged and that the imbedding boric acid merely furnishes the necessary conditions. The spectra, of which several emission and absorption are reproduced, are in general closely similar to those of the same substance in solid  $\text{EtOH}$ . A. R. M.

**Inorganic luminescence phenomena. V. Preparation and properties of phosphorescent sulfides of sodium and rubidium.** ERICH TIERDE AND H. REINICK. *Ber.* 56B, 666-74 (1923); cf. C. A. 16, 1909.—Prepn. of pure  $\text{Na}_2\text{S}$  proved very difficult. Action of S vapor on metallic Na in vacuum at  $200-300^\circ$ , the  $\text{CS}_2$  procedure which had proved successful for  $\text{MgS}$ , action of S or  $\text{CS}_2$  on  $\text{NaN}_3$ , all gave material contaminated by polysulfides. Reduction of  $\text{Na}_2\text{SO}_4$  by  $\text{H}_2$  at  $700-50^\circ$  was unsatisfactory although products were obtained which showed phosphorescence. Com.  $\text{Na}_2\text{SO}_4$  gave better results than pure. Porcelain, Pt, quartz and  $\text{MgO}$  were attacked by  $\text{Na}_2\text{S}$ . Graphite was found to be suitable. The best method was found to be prepn. of very small crystals of  $\text{Na}_2\text{S} \cdot 5\text{H}_2\text{O}$  by satg. abs.  $\text{EtOH}$  with purest  $\text{NaOH}$ , satg. half with  $\text{H}_2\text{S}$  and filtering into the remainder. This material was partially dehydrated over  $\text{P}_2\text{O}_5$  at  $55^\circ$  for 36 hrs. in 0.6 g. portions, and dehydration completed by heating in pure  $\text{N}_2$  at  $600-50^\circ$ , raising the temp. very gradually. The product was a loose, white powder, slightly sintered, 95%  $\text{Na}_2\text{S}$ , polysulfide-free but containing some  $\text{NaOH}$  and  $\text{Na}_2\text{O}$ . This material showed marked greenish phosphorescence when traces of Fe were present. Investigation of the effect of other metals showed Cu to be effective, giving a yellow phosphorescence. Microscopic amts. of  $\text{CuI}_2$  were added to the partially dehydrated  $\text{Na}_2\text{S}$ ; Fe was added as  $\text{FeCl}_3$  in the alc.  $\text{NaOH}$ . Sulfides of Li, K and Rb could not be similarly prepd. in cryst. form. Reduction of  $\text{Rb}_2\text{SO}_4$  in  $\text{H}_2$  at  $650^\circ$  gave phosphorescing mixts. of sulfide and sulfate. The activating metal could not be detd. A description of the phosphorescence of these sulfides is given. A. R. MIDDLETON

**Luminescence in chemical reactions.** H. ZOCHER AND H. KAUSKY. *Naturwissenschaften* 11, 194-9 (1923).—Attempts were made to create luminescence in a nonreactive compd. by its presence in the medium where a suitable chem. reaction occurs. Pure oxydisilin (A) (cf. C. A. 15, 3796) was first proved to give only a faint green luminescence when oxidized in acid soln. by  $\text{KMnO}_4$ , was then treated with a soln. of rhodamine B (B) and the resulting red leaflets oxidized with acid  $\text{KMnO}_4$ . An intense red luminescence appeared, which could also be obtained by addn. of the dye after oxidation of the A by  $\text{KMnO}_4$ . Isoquinoline red (C) gave similar effects. Rhodamine 6G (D) and acid-fast eosin (E) gave a yellow and a yellow-green chem. luminescence resp., similar to their fluorescent color, though they are red compds. This eliminated the possibility that the color of the luminescence was caused by light absorption subsequent to the reaction. Si in place of A gave similar effects with B, D and E. When aq. C was added to the reaction mixt. of Si and acid  $\text{KMnO}_4$  after luminescence had disappeared, an intense green chem. luminescence appeared. Since C has a yellow-red

fluorescence this result must have been due to the *C* being oxidized to a yellow compd. with a green fluorescence. The presence of strongly reducing *A* prevented this so that a red luminescence was obtained, whereas with *Si* the *C* was rapidly oxidized. By the oxidation of silicooxalic acid (which has not been obtained either fluorescent or luminescent) by  $\text{KMnO}_4$ , *B*, *C*, *D* and *E* were also rendered luminescent. The earlier work on luminescence and fluorescence is reviewed, with a short bibliography.

C. C. DAVIS

Theories of luminescence. ERNEST MERRITT. *Bull. Nat. Research Council* 5, Pt. 5, 5-27 (1923). The fluorescence of gases. C. D. CHILD. *Ibid* 28-42. Luminescence at high temperatures. E. L. NICHOLS. *Ibid* 43-51. Luminescence and photoactivity. ERNEST MERRITT. *Ibid* 52-60. Fluorescence and chemical change. ERNEST MERRITT. *Ibid* 61-5. Miscellaneous topics. ERNEST MERRITT. *Ibid* 66-78. Bibliography of luminescence. J. A. BECKER. *Ibid* 80-126.—Reviews. The bibliography lists 46 books and 1329 journal references for the years 1906-22.

E. H.

Optical properties of some metallic sulfides. E. P. T. TYNDALL. *Phys. Rev.* 21, 162-80 (1923).—The following optical consts. of *molybdenite* and *stibnite* were detd. in the visible region; reflectivity of a cleavage surface at 20° and 45° incidence, at room temp. and -160°; indices of refraction and extinction. The extinction modulus of *molybdenite* was calcd. from the transmission of two thin sections. Fresh cleavage surfaces of this mineral were used because of change on exposure to air. The metallic luster of these sulfides is due to the high refraction, the absorption being considerably lower than for metals. The reflectivity of cleavage surfaces of *pyrite* was measured at the same angles of incidence and temps.; while *galena* was studied at room temp. only.

F. O. ANDEREGG

Quantitative absorption of light by simple inorganic substances. II. Chlorides of arsenic, antimony and bismuth. A. K. MACBETH AND N. I. MAXWELL. *J. Chem. Soc.* 123, 370-5 (1923); cf. *C. A.* 11, 313.—From the results obtained with a Hilger spectrophotometer on solns. of azobenzene it is shown that the mol. extinction-coeff. remains the same for a particular wave length, whether a concd. or dil. soln. is employed. The value depends only on the no. of mols. of solute through which the light passes. and no diln. effect will be observed if a compensation cell of solvent is interposed in the path of the light falling on the variable sector. Beer's law is obeyed, therefore, with a spectrophotometer. The values of the mol. extinction-coeffs. observed in the As-Sb-Bi group show that this factor increases with increase of the at. wt. of the element.

H. JERMAIN CREIGHTON

The lead arc spectrum. WALTER GROTRIAN. *Naturwissenschaften* 11, 255-6 (1923).—A discussion of the new series of absorption lines reported by Thorsen (*C. A.* 17, 1753) in the Pb arc spectrum, with new data. A quartz tube contg. pure Pb was evacuated and heated in an elec. oven. The absorption spectrum was photographed in the usual way by a quartz spectrograph with a W filament lamp as the source of light. When the temp. was slowly increased, the absorption line  $\lambda = 2833$  appeared at 700-800° and on further increase of temp. increased considerably in intensity and breadth. This line was not reported by Thorsen. At approx. 1100° other fainter absorption lines appeared which are listed individually. A detailed discussion of the significance of the individual lines is included.

C. C. DAVIS

Spectral study of the triboluminescence of substances. HENRI LONGCHAMON. *Compt. rend.* 176, 691-3 (1923).—It was shown before that the triboluminescence spectrum of saccharose in air was identical with the so-called second positive band spectrum of  $\text{N}_2$ . Now *tartaric acid*,  $\text{CdSO}_4$ , *U nitrate* and *F* are studied in the same way and in each case the spectrum of triboluminescence coincided with the  $\text{N}_2$  band spectrum. The triboluminescence of these 5 substances, very different in chem. constitution and in crystal structure, is thus shown to be due to the same phenomenon: an effluvia in  $\text{N}$  or air.

W. F. MEGGERS

The ultra-violet absorption spectra of benzoic acid and of three hydroxybenzoic acids. ARMAND CASTILLER AND F. W. KLINGSTEDT. *Compt. rend.* 176, 749-50 (1923).—The ultra-violet absorption coeffs. of  $\text{BzOH}$  in hexane soln. and of *o*-, *m*-, and *p*-hydroxybenzoic acids in hexane + 10% ether are presented in graphs and tables for the wave length interval 1935-3400 Å. Introducing a  $\text{COOH}$  group in benzene produces a shift of the spectrum toward the red, increases the absorption coeff. about 4-fold and widens the benzene bands. The *o* and *m* derivs. also increase the absorption and show similar spectra of 3 bands each, but the *p* deriv. has 5 narrow bands between 2828 and 2671 Å. and strong wide bands at 2519 and 2100 Å.

W. F. MEGGERS

The ultra-violet absorption spectra of veratrine and vanillin. PIERRE STEINER.

*Compt. rend.* 176, 744-6(1923).—These are new examples showing the influence of successive introduction of different at. groups in the mols. of benzene derivs. upon their absorption spectra. The absorption coeffs. for the ultra-violet spectrum are given in tables and graphs for benzene, veratrine, vanillin and BzH. W. F. MEGGERS

**Ultra-violet absorption spectra of cresol.** F. W. KLINGSFELDT. *Compt. rend.* 176, 674-6(1923); cf. C. A. 16, 1908.—The absorption coeffs. of cresol in hexane soln. are measured in the ultra-violet by using an Al spark under water as a source and measuring the spectrograms with a microphotometer. The *o*- and *m*-cresol each show two bands:  $\lambda$ 2780, 2716 for *o*- and 2796, 2720 for *m*-. *p*-Cresol gives 7 narrow bands between 2858 and 2644. The results are presented in a graph of absorption coeffs. vs. wave lengths. W. F. MEGGERS

**Remarks on series spectra whose emission involves more than one electron.** GREGOR WENTZEL. *Physik Z.* 24, 104-9(1923).—Recently several attempts have been made to explain complicated line-spectra on the assumption that in addn. to the characteristic series-electron, a second electron also plays a part in the emission of the spectra. This idea is discussed and extended in 3 examples: (1) the Ne spectrum, (2) the alk. earths, especially Ca, and (3) the spectra of Cr and Mn. A suggestion is offered on the series designation for certain regularities in the arc spectrum of Mn. W. F. M.

**Intensity relations in the second subordinate series of sodium.** HANS BARTHEL. *Z. Physik* 14, 169-72(1923).—The intensity ratio of the first lines of the principal series of Na has been found to be  $D_2/D_1 = 2$  in absorption. Now this ratio is measured for 5 pairs of lines in the sharp series by photographing, with a prism spectrograph, the spectrum of a C arc whose + pole contained NaCl, and measuring photographic ds. with a microphotometer. The stronger lines of each pair in this series are, within exptl. error, twice as intense as the weaker components. W. F. MEGGERS

**Nature of the excitation of atomic and molecular spectra of hydrogen by electronic impact.** VICTOR v. KRUSSLER. *Z. Physik* 14, 19-31(1923).—A discussion of investigations described in the literature on excitation of the spectra of  $H_2$ , as well as new expts. here presented, shows that the dissociation of  $H_2$  by electronic impact occurs in two stages, the first representing the excitation of the mol. and the second taking place if the excited mol. is disturbed before it radiates. Expts. were made in  $H_2$  at various low pressures and also in mixts. of  $H_2$  and He, the spectra being produced by impact of electrons from a tungsten wire. These electrons were accelerated in measured potential gradients and the resulting spectra were recorded with a small prism spectrograph. With applied potentials up to 16 or 17 v. in pure  $H_2$  at all pressures only the many-line spectrum characteristic of the mol. appeared, and with higher potentials the Balmer series due to at. H appeared. The addn. of He to rarefied  $H_2$  enhanced the Balmer series and greatly increased the intensity of lines with shorter wave lengths. Different potentials and pressures produced remarkable variations in the relative intensities of lines in the mol. spectrum. The distribution of intensity is shown to depend on the speeds of the electrons exciting the spectrum. The lowest ionization level for  $H_2$  appears to result in breaking up the  $H_2$  mol. into a normal atom, a H ion and an electron. W. F. MEGGERS

**The line spectrum of chlorine in the ultra-violet (region  $\lambda$  3354-2070 Å).** W. JEVONS. *Proc. Roy. Soc. (London)* 103A, 193-204(1923).—About 200 lines between 3354 Å. and 2070 Å. were observed in the line spectrum of Cl. The source was a glass discharge tube (with a quartz window for end-on observation) which was excited by an induction coil. Leyden jars were introduced in the circuit to study the effect of capacity on the intensity of the lines. A 10-foot concave grating and a quartz prism spectrograph were employed to photograph the spectra. Lines of the spectra of C, Hg, Au, and O were observed as impurities. The table contains, in addn. to the Cl lines expressed in international units, the wave numbers corrected to vacuum, and estimates of the intensities of the lines with different capacities. A few pairs of lines between which const. frequency differences exist are indicated. C. C. KIRSS

**Induction spectra and spark spectra.** LOUIS DUNOVER. *Compt. rend.* 176, 953-5(1923).—Induction spectra are produced when a vapor is excited to luminescence with an electromagnetic field of high frequency. The character of the spectra will depend upon the temp. of the excited gas and upon the potential of the oscillatory discharge. Such spectra have been called spectra of the ionized atom or spark spectra by other investigators, but it seems more legitimate to retain a name suggestive of the mode of production, although induction spectra contain spark lines or lines which are due to the ionized atom. C. C. KIRSS

**The distribution law of bands in the ultra-violet absorption spectrum of toluene vapor.** VICTOR HENRI AND E. WALTER. *Compt. rend.* 176, 746-8(1923).—More than



200 narrow bands have been measured in the absorption spectrum of toluene vapor. These lie in the ultra-violet between 2325 and 2731 Å. and are sharp on the short wave side. Many of these can be measured with a precision of 0.1 or 0.2 Å. An empirical formula which satisfactorily expresses the frequencies corresponding to the bands is given. From the fine-structure of the bands a moment of inertia of  $21 \times 10^{-40}$  is deduced for the toluene mol.

W. F. MEGGERS

**The many-line spectrum of hydrogen.** E. GEHRCKE and E. LAU. *Sitzb. preuss. Akad. Wiss.* 24, 453-8(1922).—The spectrum of H from 3700 to 6700 Å. was photographed with a large grating and is reproduced natural size on two plates. Electrolytic H of less than 1 mm. pressure was excited in a glass tube, 60 cm. long and 0.5 cm. diam., by transformer discharge. To reduce the intensity of the Balmer spectrum and increase that of the many-line spectrum the inner wall of the tube was lightly silvered. Attention is called to certain groups of lines which show apparently regular spacing and are called  $\Delta\lambda$ -bands. Introducing Leyden jars and a spark gap in the circuit simplifies the spectrum and alters the intensities of many remaining lines. This effect is similar to that observed by Merton in mixts. of H and He and is ascribed to disturbances produced by the elec. fields of atoms. The widths of some of the lines were remeasured, indicating that the many-line spectrum originates with H<sub>2</sub> or H<sub>3</sub> while the Balmer spectrum arises in H.

W. F. MEGGERS

**New observations on the phototropy of inorganic systems.** JOSÉ R. MOURELO. *Anales soc. españ. fis. quim.* 20, 601-5(1922).—A further discussion of a previous paper on the phototropy of Ca, Sr, and Ba sulfides. Cf. C. A. 16, 4127. L. E. GILSON

**Study of the catalytic action of ultra-violet rays.** LOUIS BOURGOIN. *Can. Chem. Met.* 7, 95-6(1922).—Various reactions which proceed ordinarily with a catalyzer were studied in its absence under exposure from a quartz Hg arc lamp. 0.32% SO<sub>2</sub> was obtained from SO<sub>3</sub>. When C<sub>2</sub>H<sub>2</sub> and O<sub>2</sub> were bubbled through H<sub>2</sub>O, CH<sub>3</sub>COCH<sub>3</sub>, and traces of CH<sub>3</sub>CHO were found. Oxidation of C<sub>2</sub>H<sub>4</sub>, CH<sub>3</sub>COOH, and CH<sub>3</sub>OH led to recognized products. Hydrogenation gave ambiguous results. G. R. FONDA

**Photolysis of tartaric acid and the hydroxy acids.** M. VOLMAR. *Compt. rend.* 176, 742-4(1923).—Under the action of ultra-violet radiation from a quartz Hg lamp, and also of sunlight to a much less extent, the hydroxy acids and their salts are decompd. CO<sub>2</sub>, CO and H are formed, and also a volatile aldehyde and a non-volatile, reducing substance closely related to glucose. In a very alk. medium all of the CO and a part of the H disappear to form the glucose substance. The relationship is pointed out to the similar reactions which take place in the *maturing of fruit*.

G. R. FONDA

Spectral energy sensitivity of photographic materials (JONES, SCHOEN) 5. Phosphorescence and luminescence in calcites (HEADDEN) 8.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Some problems in electric furnace operation.** F. V. ANDREAE. *J. Am. Inst. Elec. Eng.* 42, 498-509(1923).—Based upon the theory that the reactance of a 3-phase elec. furnace does not depend upon the load but is a const. depending on the arrangement of the conductors, the general equations of the 3-phase furnace are developed and discussed.

C. G. F.

**Electric furnace makes ferro-vanadium.** B. D. SAKLATWALLA and A. N. ANDERSON. *Elec. World* 81, 452-6(1923).—A new type of elec. furnace has now made possible the manuf. of Fe-V by reduction by C. The high temp. required is secured by designing a small crucible with close spacing of electrodes. Because of the chem. activity of the metal after reduction it is instantly removed from the high-temp. zone. The com. furnace is a 4,000 kw., 3-phase, 60-cycle unit operating on 220 v. The lining is rammed in coke, tar, and pitch on a base of C blocks, with a layer of brick next the furnace shell. The cover is water-cooled. Electrodes dip into the slag bath. The pulverized and mixed charge is delivered by automatic feeders directly to the hottest zone of the furnace between the electrodes. The feed is continuous and is regulated in proportion to energy input in the furnace. In order to keep the high temp. const. an electrode regulator was devised which is activated by amperage and voltage simultaneously, thus maintaining const. energy input. Details of electrode holders, regulating devices, bus-bar systems, and transformer equipment are given.

LOUIS JORDAN

**Conversion of diamonds into graphite (in Arsem furnace).** M. DEK. TROMPSON

AND P. K. FROLICH. *Trans. Am. Electrochem. Soc.* **43**, preprint(1923).—Previous work on this conversion are in disagreement as to results. T. and F. heated diamonds in a small Arsem vacuum furnace for varying periods at various temps. Diamonds changed slowly at 1650° to a substance giving the Brodie test for graphite. The speed of this change was increased 26 times by raising the temp. 100°. Diamonds turn dark at 1000° owing to the formation of cracks, produced by small black specks.

A. H. DICK

**Platinum and platinum-rhodium alloy for thermocouples (Ajax Northrup furnace).** R. P. NEVILLE. *Trans. Am. Electrochem. Soc.* **43**, preprint(1923).—One of the essential properties of thermocouples is constancy of calibration. An investigation was carried on at the Bureau of Standards to det. conditions for minimizing variations. The melting was carried on in an Ajax-Northrup high-frequency induction furnace. As refractories lime, ThO<sub>2</sub> and ZrO<sub>2</sub> were used. An attempt was made to minimize the reduction of the refractory in the process of melting. Best results were obtained by rapidly heating to just below the m. p., followed by slow heating to fusion. Selective freezing of the molten alloy was prevented by casting in a chilled mold. Directions are offered for rolling and drawing the metal and the alloy. The products obtained showed a drop of 1° after heating at 1600° for 25 hrs.

A. H. DICK

**Electrolytic oxygen-hydrogen production.** E. A. LOF. *Chem. Age (N. Y.)* **31**, 109-14(1923).—A detailed study of the uses of O and H, discussion of their electrolytic production on the basis of the electron theory and of their electrochem. behavior and electrodeposition, description of type and capacity of the cells used, and careful consideration of power supply and control equipment. Recent demand for H in hydrogenation of oils together with future use in manuf. of synthetic NH<sub>3</sub> makes imperative cheap H by electrolytic method. H<sub>2</sub>O with NaOH in soln. is passed between two metal electrodes sepd. by porous diaphragm and O and H are evolved in almost quant. amts. Cells are of two types, filter press and so-called unit type. Filter press cells are composed of bi-polar Fe plate electrodes sepd. by asbestos diaphragm; unit type has each cell as an independent unit. The Electrolabs cell described consists of 3 compartments; O is generated in the two outer ones and H in the center, with two steel frames and asbestos as diaphragms. The electrodes are sepd. and insulated by spacers and plated to reduce overvoltage. Cells are built in capacities of 200 to 1000 amps., operate at about 2.2 v. and are connected in series-parallel combination to equalize the voltage of generator used. Size of cells was recently increased to 10,000 amp. and operating voltage was found to be 2.5. Source of d. c. power is either from motor-generator or synchronous converter, but regulation from former is much greater. When first started the cells have practically no counter e. m. f. and current must be held in check to about 25% by suitable rheostat to prevent opening of circuit breaker. The resistance is gradually cut out as electrolysis proceeds until full load is on cell bank. Several combinations of elec. machines are described for regulating the voltage to suit the cells, it being recognized that a very definite control of polarity, voltage and current is essential. The G. E. Co. has devised a set of protective app. to prevent polarity reversal and excessive current. A permanently polarized reverse polarity relay in series with a very special voltage relay acts to prevent the circuit breaker from being closed, or trips it when potential is reversed, while an undervoltage relay does the same when potential drops too low. The polarized relay picks up automatically at 30-40% voltage but the undervoltage relay is set by hand.

HOWARD E. BAYSFORD

**Electrolytic separation of noble metal alloys.** R. CARL. *Oesterr. Chem. Zig.* **26**, 43-5(1923).—A review. The technical details of a no. of electrolytic methods, such as the Wohlwill, Dietzel and Moebius, of sepg. Au, Ag, and Cu from their alloys are described. Numerous literature and pat. references are appended. M. KNOBEL

**Electrodeposition of nickel on zinc.** A. K. GRAHAM. *Trans. Am. Electrochem. Soc.* **43**, preprint(1923).—When plating on a metal such as Zn of high soln. pressure with a metal (Ni) possessing a low soln. pressure, two reactions must be considered. The first is the immersion deposition, which is to be avoided if a sound deposit is desired, and the second reaction is the electrodeposition. If the Zn or high-Zn alloy is given a preliminary strike, it may be transferred to a regular Ni soln. to be plated under the usual conditions. A high initial current density of 5-6 amp./sq. dm. for 75-90 sec. will change the potential of the cathode to the soln. from -0.473 v. for Zn to -0.265 v., which is positive enough to avoid secondary reactions. C. H. E.

**The effect of iron on the electrodeposition of nickel.** M. R. THOMPSON. *Trans. Am. Electrochem. Soc.* **43**, preprint(1923).—Deposits of 0.25 mm., or over, were made without difficulty in the presence of considerable Fe. With proper control of H-ion concn. ( $p_H$  5.8-6.0), the presence of Fe does not cause cracking or peeling of deposits,

although the Fe alters the structure of the deposit. Ni with 2-7% Fe gives an "alloy" deposit which is harder, finer-grained, more brittle (and under greater strain) than a pure Ni deposit. Both an increase of Fe and H-ion concn. favor peeling etc., but apparently exfoliation is unlikely if H-ion concn. is kept within the above limits. Review of results of earlier workers leads to the conclusion that their troubles with peeling and cracking were due to excessive H-ion concn. Occluded basic ppts. contg. Fe may render the deposit porous and dark. C. H. E.

**Electrodeposition of copper.** W. E. HUGHES. *Brass World* 19, 110-2 (1923).—Details of the alk. cyanide bath, working conditions, and electrode reactions. Cf. C. A. 17, 930, 1756. C. H. ELDRIDGE

**Electrolytic and chemical chlorination of benzene.** ALEXANDER LOWY AND H. S. FRANK. *Trans. Am. Electrochem. Soc.* 43, preprint (1923).—The previous work is briefly reviewed and some inconsistencies are pointed out. The authors show that  $C_6H_6$  can be chlorinated electrically and that  $I_2$  aids appreciably as a carrier.  $H_2O$  acts as a carrier in the chem. chlorination. M. KNOBL

**Electrical precipitation in chloride volatilization process.** T. VARLEY AND H. W. CLARK. *Gen. Elec. Rev.* 25, 767-73 (1922).—A semi-com. lab. installation of the Cottrell precipitator at the Univ. of Utah has been used for the recovery of fumes from Pb-Ag and Cu operations and efficiencies up to 99% have been recorded. Another installation at Salmon City, Idaho, was tested on a 35 ton per day charge, assaying 6% Cu with a tailing of 0.5% Cu. An efficiency of 95% was obtained. If the chloride volatilization process proves a com. success it is estd. that, in a plant treating 500 tons of 5-6% Cu ore per day, the treaters will recover the equiv. of 50,000 lbs. of Cu. Lower voltages, closer electrode spacing, and improved elec. equipment are now being considered in the study of efficiency by the Cottrell precipitator. W. E. RUDER

**Million volt testing set.** A. B. HENDRICKS, JR. *Gen. Elec. Rev.* 25, 737 (1922); 26, 93-100 (1923).—The design and construction of three 500 k. w., 573,000-v. transformers, and of the 500 k. w., insulating transformer, which constitute the million v. set, are first described. Illustrations are shown of single phase arcs between sharp points spaced at 9, 11, and 14 ft. apart, representing current voltages of effective values of voltage up to 1,500,000. In the second part, three-phase Y and delta arcs, tests on line insulators, wave form and effect of resistance and reactance in the circuit are discussed. W. E. RUDER

**Relative performance of tungsten filament lamps under test upon alternating and direct-current circuits.** ANON. *J. Am. Inst. Elec. Eng.* 42, 544 (1923). C. G. P.

**Evaporation characteristics of W (Fonda) 2. Carbides of W (ANDREWS) 6. High temperature investigation (NORTHROP) 2.**

**Storage battery.** N. M. HOPKINS. U. S. 1,452,806, Apr. 24. Structural features of gas vents.

**Electric indicator for determining height of electrolyte in storage batteries.** D. R. PRICE. U. S. 1,453,602, May 1.

**Electron-emitting cathode.** J. L. BRADFORD. U. S. 1,453,267, May 1. Electron-emitting audion tube cathodes are formed by mixing together a base material such as W or Mo 95% and 5% of  $SrO$  (or other oxides such as  $BaO_2$ ) and Pd chloride or an equiv. metallic chloride. Cathodes of this compn. are adapted for use at low red heat.

**Electrolytic cell for use as a condenser.** C. LUG. FORTESCUE. U. S. 1,453,388, May 1. Structural features.

**Electrolytic cell for generating hydrogen and oxygen.** D. A. BRADING. U. S. 1,452,589, Apr. 24.

**Electrolysis of mixed metal salts.** H. PAULING. U. S. 1,452,813, Apr. 24. Electrodes of the more conductive metal of mixed metal salt solns. are used to decompose the solu., e. g., Cu electrodes in a solu. formed by dissolving brass in  $H_2SO_4$ , are employed for obtaining a layer of solu. enriched in  $CuSO_4$  underlying a solu. enriched in  $ZnSO_4$ .

**Pure caustic alkalis from impure solutions.** K. HEINEMANN. U. S. 1,453,132, Apr. 24. Impure caustic alkali solns. are electrolyzed, using Hg cathodes, and the resulting alkali amalgam is decompd. by  $H_2O$ .

**Electrodeposition of tin.** L. D. SIMPKINS. U. S. 1,452,573, Apr. 24. An electrolytic bath of a Sn salt, e. g., stannous sulfate, is formed with an admixt. of a peptone or other colloid and  $\beta$ -naphthol, which serve to facilitate production of dense coherent deposits.

**Pure powdered lead.** KENJI MATSUO AND SEIJIRO SAIYO. Japan. 40,828, Nov.

30, 1921. Spongy Pb can be prepd. by electrolysis of  $\text{Pb}(\text{NO}_3)_2$  soln., in which, however, the oxidation of the product makes it impure. Addn. of 10 g. of grape sugar or 9.5 g. of cane sugar to 1 l. of 4%  $\text{Pb}(\text{NO}_3)_2$  soln. prevents the oxidation and the process goes smoothly. As electrodes Pb plates were used, being placed at a distance of 1-1.5 in. C. d. is 4-6 amp. per 100 sq. cm. of cathode and the voltage 1-2 v.

**Apparatus for electrical precipitation of suspended particles from gases.** W. A. SCHMIDT. U. S. 1,453,325, May 1. A vertically extending discharge electrode is mounted on an insulated support from which it extends downwardly. A hammer is mounted on the insulated support for applying a vertical blow to the upper end of the electrode.

**Electric furnace.** YOSHIKI TADOKORO. Japan. 40,742, Nov. 28, 1921. The furnace has 2 porcelain cores having the same center upon which heating wires are wound. The no. of coils is larger in the 2 ends than in the center and the elec. current is passed oppositely in the 2 coils. The temp. in the furnace is almost const.; e. g., it is almost  $1,000^\circ$  in 80% of the total length of the furnace, while about  $800^\circ$  in the 2 ends. The furnace is further non-magnetic.

**Electric zinc-smelting furnace.** B. RAEDER. U. S. 1,452,934, Apr. 24. The furnace comprises 3 superposed communicating chambers, the uppermost constituting a preliminary drying chamber, the intermediate chamber serving for preheating and the bottom chamber being employed for reduction. The drying chamber is heated by combustion gases from the intermediate chamber and an electrode extends down into the reducing chamber through the other 2 chambers. Cf. C. A. 16, 689.

**Tilting electric arc furnace adapted for melting metals.** A. W. GREGG. U. S. 1,453,347, May 1.

**Protecting electric furnace resistors.** G. M. LITTLE. U. S. 1,453,397, May 1. Hydrocarbon vapor from a burner in the lower part of a furnace serves to protect against oxidation a carbonaceous resistor located near the top of the furnace chamber. Cf. following pat.

**Protecting electric furnace resistors.** G. M. LITTLE. U. S. 1,453,399, May 1. A plunger pump supplies oil or other hydrocarbonaceous liquid to furnace chambers to protect carbonaceous resistors from oxidation by air entering the furnace. Cf. above.

**Self-lightening water-cooled terminal for electric furnace resistors.** G. M. LITTLE. U. S. 1,453,398, May 1.

**Electroplating apparatus.** W. THOMPSON and W. R. JAMESON. U. S. 1,453,419, May 1.

## 5—PHOTOGRAPHY

**Earliest apparatus and procedures of photography; contributions to the centenary of modern photographic methods.** HENRY LEFFMANN. *J. Franklin Inst.* 195, 327-36 (1923).—Historical review.

JOSEPH S. HEPBURN

**The theory of the characteristic curve of a photographic emulsion.** II. F. C. TOY. *Phil. Mag.* 45, 715-26 (1923).—In Part I (C. A. 16, 4151) the theory was advanced, to explain the exptl. relation between the no. of geometrically identical Ag halide grains rendered developable and the light intensity, that there exist in the grains specially light-sensitive points. They are distributed among the grains by chance and only those having at least one are developable. This theory is not in accord with that of Silberstein (C. A. 16, 3441; 17, 498) based on a discrete light quantum theory and the probability of striking grains depending upon their projected area. S.'s theory is critically considered and reasons are given for holding it to be wrong. The hypothesis of Svedberg (C. A. 17, 30, 31) and his supporting data are also criticized. The true curve relating  $\nu_2/\nu_1$  to light intensity is then developed ( $\nu_1$  and  $\nu_2$  are the av. no. of active centers per unit surface for two different grain sizes) and it is shown that Svedberg's claim that  $\nu_2/\nu_1 = \text{const.}$  independent of light intensity is by no means generally true, but is the special case represented by the flat part of the curve neglecting the higher intensities. S. C. LIND

**Three-color transparencies by combined chemical toning and dye printing.** T. G. TURRON. *Brit. J. Phot.* 69, suppl. 41-2 (1922).—A Fe-toned transparency on glass is made from the red-filter negative. The blue-filter negative is printed on film and the image converted to  $\text{PbCrO}_4$  and varnished to increase its transparency. The green-filter negative is printed on a fixed-out film sensitized with  $\text{K}_2\text{CrO}_7$ , and the image dyes with magenta after development.

L. DERR

**Deterioration of sulfite-hydroquinone solutions with keeping.** J. PINNOW. Z.

*wiss. Phot.* 22, 72(1922).—In slightly alk. soln. quinone is only slightly reduced by boiling with  $\text{Na}_2\text{SO}_3$ , but with  $\text{NaHSO}_3$  in slightly acid soln. is reduced to Na hydroquinonemonosulfonate, which has some value as a developer. At room temps., however, there is no reduction over long periods of time, and regeneration of developer by sulfite from oxidized hydroquinone is unprofitable. L. DERR

**Action and purpose of sulfite in developing solutions.** J. PINNOW. *Phot. Rundschau* 60, 27-9(1923).—Though it may be ultimately necessary to abandon the hypothesis that the sulfite regenerates the active agent of the developer, it seems unwise at present to do so. L. DERR

**(Panchromatic) sensitizing and stability.** E. STENGER. *Z. wiss. Phot.* 22, 246-53 (1922).—Of 14 kinds of emulsion-dyed plates, 12-20 years old, more than half were found serviceable, and a test on one showed only slight change in spectral sensitiveness. Ten kinds of bathed plate, 13-19 years old, were found useless because of excessive fog. Expts. on artificially aged plates showed that  $\text{NH}_4\text{OH}$  without  $\text{NH}_4\text{Br}$  favored color-sensitiveness at the expense of keeping quality, while  $\text{NH}_4\text{Br}$  without  $\text{NH}_4\text{OH}$  was a useful addn. to the plates stored longest at high temp. L. DERR

**Spectral energy sensitivity of photographic materials.** L. A. JONES AND A. L. SCHORN. *J. Optical Soc. Am.* 7, 213-7(1923).—Photographic materials were exposed to monochromatic radiation of known intensity; developed under standard conditions, and the resulting densities detd. Monochromatic radiation of great purity was obtained by using a Hilger ultra-violet monochromatic illuminator. The energy measurements were made by means of a linear thermopile and a galvanometer of high sensitivity. Between  $\lambda = 400$  to  $460 \mu$  the energy necessary to produce a density of 1, at  $\gamma = 1$ , on a moderately fast plate, under standard conditions of development, was of the order of 0.1 to 0.2 ergs/sq. cm. or about  $3 \times 10^{10}$  to  $4.5 \times 10^{10}$  quanta per sq. cm. Values are given for the no. of quanta falling on grains of different sizes at the exposure used. E. P. WIGHTMAN

**Studies in photographic sensitivity. II. The action of hydrogen peroxide on photographic gelatin-silver halide emulsions.** S. E. SHEPPARD AND E. P. WIGHTMAN. *J. Frank. Inst.* 195, 337-47(1923); cf. *C. A.* 16, 4151.—"The sensitometric characteristics of photographic plates exposed to  $\text{H}_2\text{O}$  and developed are strikingly similar, for time of exposures, time of development, and intensity (*i. e.*, concn.)." The characteristic curves include a period of reversal. It is suggested that the decomn. of  $\text{H}_2\text{O}_2$  is chemiluminescent; short wave length radiation is produced at the surface of the grain of Ag halide, particularly at photosensitive nuclei. JOSEPH S. HERBURN

**Color change of photographic print-out images on fixing.** F. FORMSTECHE. *Phot. Ind.* 1921, 590.—The reversible color change produced on immersing a print in distd. water is probably due to an alteration in the distance between the grains as a result of swelling of the film. Irreversible color changes are produced by the action of ions on the film, causing a coagulation of colloidal to coarse-grained yellow-brown Ag. The medium exerts an important influence on this change. Since the color of a print varies between red and blue according to the compn. and degree of ripening of the emulsion, the fixed image also takes on different tints. The bluer the copy the greater is the deviation from the normal yellow-brown color of coagulated silver, and the redder are the tones obtained on fixing. The colors of Poitevin photochromes depend on the optical resonance of the Ag ultramicros, and each contact with solus. brings about coagulation and so alters the colors. J. S. C. I.

**Sensitive photographic films.** J. E. BRANDENBERGER. U. S. 1,452,785, Apr. 24. Sensitive films are prepd. by successive treatment of the carrier base, *e. g.*, cellulose from a celulo-xanthate, with solns. of reactive substances such as  $\text{AgNO}_3$  and KBr.

**Cinematographic films.** D. F. COMSTOCK AND J. A. BALL. U. S. 1,451,325, Apr. 10. Features of arrangement of a series of complemental images.

**Photographic production of transfer printing plates.** R. JOHN. U. S. 1,453,258, Apr. 24. A sensitized emulsion is treated with a color, complementary to exposure light to be used, and exposed to lights and shades to be recorded for making a transfer printing plate. Portions most strongly affected by the exposure are hardened by treatment with a hardening agent such as pyrogallol mixed with such a proportion of  $\text{Na}_2\text{SO}_3$  or other neutralizing agent as to control the effective area of the hardening.

**Printing plates.** R. JOHN. U. S. 1,453,259, Apr. 24. A colloidal coating on a support backing is hardened, sensitized with a chromic acid salt, *e. g.*,  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ , and then exposed to a light image. The difference in " $\text{H}_2\text{O}$ -receptiveness" of the exposed and unexposed portions is accentuated by treatment with alc. or alc. and ether mixt. and the unaffected portions of the salt are removed from the colloidal coating, the latter

is hardened, heated, moistened, treated with ink and the ink is emulsified with  $H_2O$  on the plate and transferred.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

**The precipitation of metals by hydrogen sulfide.** G. MCPHAIL SMITH. *Science* 57, 447-9(1923); cf. *C. A.* 16, 2459.—When one mol. of  $H_2S$  is added to 1 or 2 mols. of  $Hg(ClO_4)_2 \cdot 4H_2O$  in soln. a sol. complex salt,  $Hg(ClO_4)_2 \cdot HgS$ , is formed. This complex reacts with sol. chlorides, nitrate or sulfates to yield insol. ppts. of the compn.  $HgCl_2 \cdot 2H_2S$ ;  $Hg(NO_3)_2 \cdot 2H_2S$ , or  $HgSO_4 \cdot 2H_2S$ , or it spontaneously decomposes into  $Hg(ClO_4)_2 \cdot 2H_2S$  and  $Hg(ClO_4)_2$ . BENJAMIN S. NEUHAUSEN

**Production and characteristics of the carbides of tungsten.** MARY R. ANDREWS. *J. Phys. Chem.* 27, 270-83(1923).—A study of the reaction of incandescent W and hydrocarbon vapors. At the surface of an incandescent filament above  $1600^\circ$ ,  $C_{10}H_8$  is quant. decompd., its entire C uniting with the W. The cond. decreases with absorption of C until the filament is entirely converted into  $W_2C$ , then increases until the latter is completely converted into WC. Both  $W_2C$  and WC are brittle. Further heating deposits a shell of C, and the cond. remains approx. const. No evidence of  $W_2C$  was found (cf. Ruff and Wunsch, *C. A.* 8, 1717). Cross sections of partially carbonized filaments showed  $W_2C$  as a ring surrounding a core of pure W. Decompn. of  $C_{10}H_8$  and of toluene was more rapid during formation of  $W_2C$  than during conversion of  $W_2C$  to WC. Approx. resistivities of  $W_2C$  at different temps. are given and the cond. of partially carbonized W is proved to be the sum of the conds. of its 2 components. Carbides were also obtained from toluene, anthracene,  $C_2H_2$ ,  $CH_4$ , illuminating gas and  $EtOH$ . Decarbonization occurs at rates depending on the temp. by heating carbonized filaments *in vacuo* and by flashing in H at high pressures. New data are given for vapor pressures of  $C_{10}H_8$  and toluene at low temps. The app. is described and illustrated. C. C. DAVIS

**Basic aluminium sulfate.** F. S. WILLIAMSON. *J. Phys. Chem.* 27, 284-9(1923).—When 2-4 mols. of NaOH are added to 1 mol. of K alum, the compn. of the ppt. is invariable, analysis indicating a basic Al sulfate of the approx. compn.  $Al_2(SO_4)_3 \cdot (Al_2O_3)_4 \cdot 15H_2O$ . The compd.  $(Al_2O_3)_4 \cdot H_2SO_4$  obtained by Schlumberger by addn. of 5 mols. of KOH to 1 of K alum (cf. *Bull. soc. chim.* 13, 41(1895)) was a mixt., due to addn. of excess KOH.  $Al_2(SO_4)_3 \cdot (Al_2O_3)_4 \cdot 15H_2O$  loses less than 10% of its  $H_2O$  over concd.  $H_2SO_4$  at room temp., but nearly all  $H_2O$  is evolved at  $150^\circ$ . Less than  $1/3$  is reabsorbed at lower temps., indicating that the compd. is not a reversible hydrate. C. C. DAVIS

**Basic chromic sulfate.** F. S. WILLIAMSON. *J. Phys. Chem.* 28, 384-8(1923).—480 g. of  $K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$  was dissolved in enough  $H_2O$  to make 6 l. of soln. The soln. was equally divided into six 2-l. beakers. To these beakers were added standard NaOH soln. in such amts. that they contained 1, 2, 3, 4, 5 and 6 mols. per mol. of chrome alum, resp. The first did not give enough ppt. to analyze. The  $Cr_2O_3$  content in the ppts. of 2, 3, 4 and 5 varied from 55.3 to 55.6%. The  $Cr_2O_3$  content of 6 was 65.6%. The ppt. formed by adding 2-5 mols. of NaOH per mol. of chrome alum has a const. compn. which may be represented by  $7Cr_2O_3 \cdot 5SO_4 \cdot 25H_2O$ . The water is not lost at ordinary temps. in a desiccator over  $H_2SO_4$ . It is lost gradually with rising temp. until at  $250^\circ$  nearly all is gone. Only a slight portion of the water is taken up at lower temps. after being lost at  $250^\circ$ . F. E. BROWN

**The decomposition of potassium perchlorate and its catalysis by ferric oxide.** C. E. OTTO WITH H. S. FRY. *J. Am. Chem. Soc.* 45, 1134-43(1923).— $KClO_4$  decomposes into KCl and  $O_2$  according to a unimol. reaction; no Cl is involved. The particles of the  $Fe_2O_3$  catalyst increased 5-fold in diam. during the reaction, whose velocity coeff. increased in proportion to the wt. concn. of catalyst. Addn. of catalyst does not accelerate the reaction already proceeding but initiates concomitant reaction with the probable formation of intermediate compds. BENJAMIN S. NEUHAUSEN

**Attempts to prepare ceric perchlorate.** FR. FICHTER AND ERNST JENNY. *Helvetica Chim. Acta* 6, 326-0(1923).—Attempts to prep. solid  $Ce(ClO_4)_4$  by concn. of its aq. soln. were unsuccessful owing to hydrolysis, but a new basic ceric perchlorate was isolated. Aq.  $Ce(ClO_4)_4$  was best prepd. by electrolytic oxidation of  $Ce(ClO_4)_3$  (cf. *Bull. soc. chim.* 21, 535(1874); Külle, *Diss. Zürich* 1898; Mühlbach, *Diss. München* 1903). Concn. of the  $Ce(ClO_4)_4$  soln. at  $100^\circ$  transformed it completely to  $Ce(ClO_4)_3$ , insol. double salts could not be obtained, and pptn. by  $EtOH$  or with org. bases (cf.

*Z. anorg. Chem.* **18**, 305(1898)) was unsuccessful, owing to oxidation of the org. compds. By dilg. freshly electrolyzed coned.  $\text{Ce}(\text{ClO}_4)_4$  with excess  $\text{H}_2\text{O}$  or by heating too long,  $\text{Ce}(\text{OH})_4$  was formed, but with a relatively small amt. of  $\text{H}_2\text{O}$  a yellow basic ceric perchlorate was crystd. from a very coned. soln. at  $100^\circ$ , composed of spherical aggregates of fine needles contg. considerable  $\text{Ce}(\text{ClO}_4)_4$ . Analysis gave the probable formula,  $\text{Ce}_2\text{O}_3(\text{ClO}_4)_4 \cdot 12(\frac{1}{2})\text{H}_2\text{O}$ . The  $\text{H}_2\text{O}$  of crystn. is unreliable. C. C. DAVIS

**The constitution of the silicates.** G. TAMMANN. *Z. anorg. allgem. Chem.* **125**, 301-6 (1922).—T. finds that the mol. sp. heats of the silicates are additive, and concludes the the mols. are independent and at temps. far removed from their m. p. do not vibrate appreciably. This conclusion is supported by the fact that only in the neighborhood of the m. p. do isomorphous complex substances diffuse into one another visibly. In soln., silicates undergo hydrolysis, and this therefore gives no definite information as to the mols. which exist in the solid. The structure of molten silicates cannot be investigated. The complex silicates differ from the C compds. in that they are decomposed in soln. and in the fused state, and the mol. theory of org. chemistry finds no application in the chemistry of silicates. J. C. S.

**Complex magnesium salts. II.** G. SPACU. *Bul. Soc. Stiinta Cluj* **1**, 247-66 (1922); cf. C. A. **17**, 1395.—Magnesium tetrapyrindine chloride prepd. from  $\text{MgCl}_2$  and anhyd. pyridine at the ordinary temps., is a white cryst. powder; it is very hygroscopic, with sepn. of pyridine. This salt differs from the corresponding bromide and iodide in that it is not coordinately satd. Magnesium triethylenediamine chloride forms colorless crystals which cannot be resolved into their optically active components. It is highly hygroscopic. The chloride reaction is given with  $\text{AgNO}_3$ . Magnesium diaquodietthylenediamine iodide forms crystals; it is unstable in air. Magnesium triethylenediamine sulfate is a hygroscopic, white powder. Magnesium tetrapyrindine thiocyanate from Mg thiocyanate and anhyd. pyridine, forms small, colorless, highly refractive crystals; it is very hygroscopic. Magnesium hexapyrindine thiocyanate forms large, colorless, highly refractive crystals. Magnesium hexammine thiocyanate, prepd. by the action of  $\text{NH}_3$  on solid Mg tetrapyrindine thiocyanate, is a colorless powder. Mg tetraquodipyrindine chloride dipotassium chloride,  $\text{Mg}(\text{C}_5\text{NH}_5)_2(\text{H}_2\text{O})_4\text{Cl}_2 \cdot 2\text{KCl}$  is obtained by prolonged shaking of powd. carnallite with anhyd. pyridine. It is a white, cryst. powder. III. G. SPACU AND R. RIPAN. *Ibid* 287-83.—Monoaquopentamminemagnesium chloride, prepd. by passing  $\text{NH}_3$  into a soln. of  $\text{MgCl}_2$  in abs. alc. at the ordinary temp., is a colorless, cryst. powder. The following are also mentioned: hexamminemagnesium bromide, a white, cryst. powder; tetraquodiamminemagnesium sulfate, a cryst. powder; triaquotriamminemagnesium sulfate, colorless crystals; diaquodiamminemagnesium sulfate, white powder; triquopiperidinemagnesium sulfate,  $[\text{Mg}(\text{C}_5\text{NH}_5)_3(\text{H}_2\text{O})_3]\text{SO}_4$ , a slightly green substance; pentaquobenzylaminemagnesium sulfate, a white, cryst. powder. J. C. S.

**Isomorphism of potassium fluoborate and permanganate.** FERRUCCIO ZAMBONINI. *Atti accad. Lincei* [v] **31**, ii, 67-73(1922).—Z. claims priority over Barker (C. A. **7**, 1645) for his discovery of the isomorphism between K fluoborate and perchlorate (*Z. Kryst. Min.* **41**, 60(1905)). To ascertain whether alkali fluoborates are isomorphous with, or merely exhibit crystallographic relations towards, alkali perchlorates and permanganates, Z. has examd. the crystals deposited from a soln. contg. equal wts. of K fluoborate and permanganate. Mixed crystals of the fluoborate type, contg. at most 0.4% of the permanganate, are formed, but on the permanganate side the miscibility is practically zero. J. C. S.

**Crystalline form of trihydrated sodium chlorite.** ETTORRE ARTINI. *Atti accad. Lincei* [v] **31**, ii, 65-7(1922).—This salt,  $\text{NaClO}_2 \cdot 3\text{H}_2\text{O}$  (cf. Levi, C. A. **16**, 3271), crystallizes in the triclinic system:  $a : b : c = 0.4041 : 1 : 0.6353$ ,  $\alpha = 103^\circ 43.6'$ ,  $\beta = 119^\circ 3'$ , and  $\gamma = 81^\circ 46.5'$ . J. C. S.

Combination of S with C (WIBAUT) 21.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

**Analytical test for chlorates.** P. POCH. *Anales soc. españ. fis. quim.* **20**, 662-6 (1922).—The following reaction is proposed as a qual. test for chlorates: One cc. of the soln. to be tested is evapd. to dryness with 1 cc. of 0.5 N  $\text{NH}_4\text{CNS}$ . On heating to  $140-50^\circ$  an orange-red color is developed if 0.00025 g. or more of  $\text{KClO}_3$  is present. Perchlorates do not give the reaction. Iodates, hypobromites, persulfates, and molyb-

dates give a somewhat similar color. The colored substance produced is probably pseudothiocyanogen,  $C_4N_4HS_2$ . Its insolubility makes it difficult to use this reaction as a quant. colorimetric method.

L. E. GILSON

**A new test for nitrates.** I. G. NIXON. *Chem. News* 126, 261-2(1923).—2-Naphthol-6,8-disulfonic acid or "G. salt" can be used as a sensitive test for  $HNO_3$ . To 1 cc. of the soln. to be tested, add 1 cc. of concd.  $H_2SO_4$  and 5 cc. of a 1% aq. soln. of "G. salt." A distinct red color develops with 0.02 mg. of N as  $HNO_3$  and a yellow coloration is produced with less.

W. T. HALL

**The analytical utilization of chemical reactions.** F. FEIGL. *Chem.-Zig.* 47, 322, 325-7(1922).—In this lecture, delivered to the Chemico-physical Society of Vienna, the general principles governing the detection and detn. of elements are discussed. It is pointed out that there are certain special reactions which are characteristic of one element only but other reagents give sp. reactions with several allied elements. Dimethylglyoxime has been regarded as a special reagent for Ni but it is pointed out that an analogous compd. with Co has been prepd. and that the reagent gives reactions with other members of the 8th group of the periodic system. Likewise diphenylcarbazide is not a special reagent for Hg but can be used as a reagent for Cd, Zn, Mg and Be. Benzidine is a sp. reagent for those elements which yield compds. that are autoxidizable. Mo in complexes is a sp. reagent for As, Sb, Sn, Cu and  $P_2O_5$ . The formation of addn. compds. in some of these tests is explained on the basis of the Werner valence theory.

W. T. H.

**Sliding scales for the convenient titration of strong liquids by dilution and use of aliquot parts.** C. H. D. CLARK. *Analyst* 48, 164-8(1923); cf. *C. A.* 17, 1766.—Directions for making a simple slide-rule to show how to dil. a soln. to make it of a desired strength, to show about how much standard soln. should be used for titrating an aliquot part of another soln., or to tell how much of a soln. should be taken to make the buret reading of a titration numerically equal to the percentage of a given constituent.

W. T. H.

**The use of bromate in volumetric analysis.** I. The stability of bromic acid in boiling solutions. G. F. SMITH. *J. Am. Chem. Soc.* 45, 1115-21(1923).—Bromate solns. have proved unexpectedly stable in hot acid. Thus boiling 0.025 N  $KBrO_3$  with 0.8 N  $HClO_4$ ,  $HNO_3$  or  $AcOH$  produced no appreciable decompn. in 5 mins.  $H_2SO_4$  and  $H_3PO_4$  solns. were not as stable. Free  $Br_2$  has no effect on the stability of the bromate except when  $AcOH$  is present but 10 mg. of chloride causes a slight reduction. Bromide in bromate can be detd. by making the soln. acid and distg. off the  $Br_2$ .  $Ba(BrO_3)_2$  can be used in place of  $KBrO_3$ .

W. T. H.

**The influence of alkaline earths on the determination of reducing sugars by Fehling solution.** L. EYNON AND J. H. LANE. *J. Soc. Chem. Ind.* 42, 143-6T(1923).—The presence of alk. earth sol. salts has a very serious effect upon the detn. of reducing sugars even in 0.005 N soln. Thus when the concn. of  $CaCl_2$  was 0.02 N, 27.25 cc. of a sugar soln. was required to reduce 10 cc. of Fehling soln. whereas only 25.6 cc. were required when the sugar was dissolved in pure water. Similarly the  $Cu_2O$  obtained by the gravimetric method of analysis weighed less than it should when Ca ions were present. The effect of the alk. earth is best obviated by pptn. with  $Na_2C_2O_4$ . This explains the favorable effect of removing excess Pb with  $Na_2C_2O_4$  in clarifying sugar solns. Other alk. earths behave like Ca but most other cations have no appreciable effect on the sugar reaction.

W. T. H.

**The determination of sucrose in the presence of other sugars.** ADOLF JOLLES. *Z. Nahr. Genussm.* 44, 353-4(1922).—The work of Behre and Düring is discussed (cf. *C. A.* 16, 4158). J. calls to their attention his own earlier investigations.

D. B. DILL

**Colorimetric determination of traces of thiosulfate in the presence of sulfite.** O. HACKL. *Chem.-Zig.* 47, 266(1923).—About 0.1 mg.  $S_2O_3^{2-}$  ion in 100 cc. of soln. can be detected by the reaction with  $AgNO_3$  soln. With quantities up to about 2 mg. differences in the color produced can be estd. A few drops of  $H_2SO_4$  prevents  $SO_3^{2-}$  ion from reacting with Ag and has practically no effect upon the thiosulfate test. In applying the test, 5 min. should be allowed for the reaction to proceed before comparing with the standard.

W. T. H.

**The estimation of sodium hyposulfite.** R. W. MERRIMAN. *Chemistry & Industry* 42, 290-2(1923).—When  $Na_2S_2O_4$  reacts with  $HCHO$  in aq. soln., a mixt. of  $NaHSO_3$ - $CH_3O.H_2O$  and  $NaHSO_3.CH_3O.H_2O$  is formed. The former compd. does not react with  $I_2$  in neutral or acid soln. but the latter reacts with 2 mols. of  $I_2$ . After treating 10 g. of  $Na_2S_2O_4$  with 20 cc. of 40% formalin in a liter of aq. soln., an aliquot part of the soln. can be treated with an excess of  $I_2$  and after 2 mins. the excess of the latter titrated with



standard  $\text{Na}_2\text{S}_2\text{O}_3$  soln. Fifteen mins. should be allowed for the reaction with formalin and atm. oxidation should be guarded against as much as possible by using a short necked, graduated flask. The solid sample should be poured slowly into the flask while the liquid is being rotated. A 20 cc. aliquot is recommended and 50 cc. of 0.1  $N$   $\text{I}_2$ . The results are a little lower than those obtained by the more tedious indigo carmine method.

W. T. H.

**The determination of carbon in nickel.** K. BREISCH AND K. CHALUPNY. *Z. angew. Chem.* 35, 671-3 (1922).—The Corleis wet combustion method gives good results but is slow. Using 150 cc. of 50%  $\text{CrO}_3$  soln. and 150 cc. of concd.  $\text{H}_2\text{SO}_4$ , the analysis can be accomplished in about 3 hrs. with 5 g. of coarse borings. The graphite alone can be detd. by dissolving the Ni in dil.  $\text{HNO}_3$  and burning the insol. residue as in the analysis of cast Fe. Good results are obtained by burning the residue from the electrolytic oxidation of the sample. Place the metal in a Pt dish of about 120 cc. capacity and keep it at the bottom of the dish by means of a strong magnet placed below. Electrolyze for about 4 hrs. with a current of 3-4 amps. with a Cu wire as cathode and the Pt dish as anode, using 20 cc. of  $\text{H}_2\text{SO}_4$  (d. 1.14) for each g. of metal and stirring the bath continuously. The direct combustion of the metal is likely to give low results unless special precautions are taken. Heat for 30-40 min. at  $1200^\circ$  in  $\text{O}_2$  with a Pt gauze spiral directly in front of the boat and remove  $\text{SO}_2$  by passing the evolved gases through a tube contg.  $\text{CrO}_3$ .

W. T. H.

**Acidimetric titration of magnesium in its salts.** I. M. KOLTHOFF. *Rec. trav. chim.* 41, 787-94 (1922).—The potentiometric detn. of Mg (cf. Hildebrand, *C. A.* 7, 3070) by acidimetry is not recommended. The titration is long, quite concd. solns. ought to be used (more concd. than 0.5  $N$ ) and the accuracy does not exceed 1 to 2%. Mg may be detd. with equal accuracy by titrating the boiling soln. of the Mg salt, 0.5  $N$  or stronger, with 1.0  $N$   $\text{NaOH}$ ; nitramine is used as indicator. The most satisfactory method consists in adding an excess of alkali to the soln. to be examd. The soln. is then made up to a detd. vol. and agitated. After standing quietly for some time, aliquot parts of the clear liquid are titrated with phenolphthalein and dimethyl yellow as indicators. The  $\text{NaOH}$  used should be practically free from  $\text{Na}_2\text{CO}_3$  and sep. titration with the 2 indicators show appreciable differences if carbonates are present in the soln. titrated. The concn. of the excess of  $\text{NaOH}$  should after diln. be at least 0.01  $N$  since excess  $\text{NaOH}$  limits the soly. of  $\text{Mg}(\text{OH})_2$  to within the allowed limits of error. Ca does not hinder.

E. J. WITZEMANN

**Volumetric determination of potassium.** MACHELEIDT. *Kali* 16, 333-5 (1922); *Wochschr. Brauerei* 1922, No. 4.—Tartaric acid 60 g. and  $\text{NaOH}$  16 g. are made up to 1 liter. To this soln. is added about 6 g.  $\text{KHC}_4\text{H}_4\text{O}_6$  and the whole allowed to stand at room temp. for several hrs. with frequent shaking until the soln. is satd. with the salt. Immediately before making a detn. the necessary amt. of this liquid is filtered off, that remaining being allowed to stand over the undissolved  $\text{KHC}_4\text{H}_4\text{O}_6$ . Thirty cc. of the bitartrate soln. is weighed into a tared flask and titrated with 0.1  $N$   $\text{Ba}(\text{OH})_2$ . From 0.5 to 0.75 g. of the mixed salts to be detd. is added in the dry state to 30 cc. of the bitartrate soln. and allowed to stand at room temp. with frequent shaking 1 to 2 hrs. until the salts are dissolved and a cryst. ppt. of  $\text{KHC}_4\text{H}_4\text{O}_6$  is formed. The soln. is then filtered into a tared flask and the filtrate titrated with 0.1  $N$   $\text{Ba}(\text{OH})_2$ . From the results of the titrations the  $\text{K}_2\text{O}$  content is calcd.  $\text{NH}_4$ , Ba and Ca compds. must be removed and the mixed salts to be tested must be made neutral in reaction. K superphosphate is treated with  $\text{NH}_4\text{OH}$ , an excess of magnesia mixt., filtered and the  $\text{NH}_4$  removed before adding the residue to the bitartrate soln.

L. W. RIGGS

**The volumetric determination of calcium.** A. VÜRTHEIM AND G. H. C. VAN BERS. *Chem. Weekblad* 20, 68 (1923); J. GROSSFELD. *Ibid* 20, 209-10 (1923).—Objections are raised to the method of G. (C. A. 17, 1399) and further expts. are described which appear to substantiate some of G.'s claims.

R. BEUTNER

**The volumetric determination of sulfate in potassium salts.** A. VÜRTHEIM. *Chem. Weekblad* 20, 172-4 (1923).—To carry out the well known chromate method it is necessary that no Fe or Mn ions should be present. About 1 g. of the original salt should be present in 200 cc. of soln., 3 cc. of 10%  $\text{HCl}$  and 1 g. of pure  $\text{BaCrO}_4$  should be added. After boiling, add  $\text{NH}_4\text{OH}$  until alk., filter, and titrate the dissolved chromate iodometrically. Standardize the thiosulfate soln. against known wts. of sulfate to allow for the exptl. error involved.

R. BEUTNER

**A new method of detecting nickel in solutions.** C. G. VERNON. *Chem. News* 126, 200 (1923).—The passage of  $\text{H}_2\text{S}$  for a short time into a hot dil. soln. of  $\text{Na}(\text{NH}_4)_2^{++}$  in concd.  $\text{NH}_4\text{OH}$  results in the formation of a lustrous mirror-like deposit which V. assumes to be metallic Ni.

W. H. B.

**The determination of small quantities of aluminium.** L. K. WOLFF, N. J. M. VORSTYMAN AND P. SCHOENMAKER. *Chem. Weekblad* 20, 193-5(1923).—Pure alizarin dissolved in 5% NaOH free from Al is a better reagent than that recommended by Atack. Directions are given for carrying out the test so that small quantities of Al can be detd.

**The titration of very small amounts of gold.** W. B. POLLARD. *Bull. Inst. Mining Met.* No. 223, 8 pp.(1923).—A soln. of 0.1% *o*-tolidine in 10% HCl is a very sensitive reagent for Au. One part of Au in 20 million parts of soln. can be detected. When the yellow or brown color has been developed, the Au can be detd. by titration with a suitable reducing agent such as mono-*p*-aminophenol hydrochloride, or metol. When aqua regia is used for dissolving the Au it is necessary to remove all the HNO<sub>3</sub> as this causes deposition of Au after diln. The HNO<sub>3</sub> may be removed by careful treatment with paraldehyde. For the detn. of quantities of Au up to 5 mg., dissolve the metal in a 200 cc. flask with 2 cc. of aqua regia. Heat till the sample is dissolved and boil carefully, while rotating the flask, until only 1 or 2 drops of liquid remain. Add 2 cc. of 1% paraldehyde soln., blow out the fumes from the flask and allow the liquid to stand 2 mins. Add 25 cc. of water, 1 cc. of the *o*-tolidine soln. and a little dil. AgNO<sub>3</sub> soln. as catalyst. Titrate carefully with 0.01 *N* in metol 2% HCl. Toward the last heat the soln. gently. If, for any reason, it is desired to repeat the titration, evap. the soln. to dryness, add 2 cc. of aqua regia and continue as before. In the presence of Fe, NH<sub>4</sub>F must be added. When large quantities of Cu are present, the results are a little high. W. T. HALL.

**The separation of tin and arsenic.** L. W. MCCAY. *J. Am. Chem. Soc.* 45, 1187-91(1923).—When a soln. contg. trivalent As and quadrivalent Sn in the presence of 0.3 *N* HCl or H<sub>2</sub>SO<sub>4</sub> and a little HF is treated with H<sub>2</sub>S, only As<sub>2</sub>S<sub>3</sub> is pptd. This may be filtered off and weighed with the customary precautions. In the filtrate, the effect of the HF can be neutralized by adding H<sub>3</sub>BO<sub>3</sub>, which forms HBF<sub>4</sub>. Sn can then be pptd. as SnS<sub>2</sub>, ignited and weighed as SnO<sub>2</sub>. W. T. HALL.

**Quantitative separation of manganese and chromium.** H. J. TAVERNE. *Chem. Weekblad* 20, 210-1(1923).—Dissolve the ppt. of MnS and Cr(OH)<sub>3</sub> in HCl, add 10 cc. of 3% H<sub>2</sub>O<sub>2</sub> and later 20 cc. more of H<sub>2</sub>O<sub>2</sub> and 20 cc. of 4% NaOH. Heat until all the Mn is converted into insol. H<sub>2</sub>MnO<sub>3</sub> and all of the Cr into soluble Na<sub>2</sub>CrO<sub>4</sub>. Filter and det. the Cr in the filtrate iodometrically. R. BEUTNER.

**Electrometric determination of zinc with silver nitrate.** E. MÜLLER AND A. ADAM. *Z. Elektrochem.* 29, 49-53(1923).—It is shown that Zn can be detd. electrometrically by adding an excess of KCN to the soln., and titrating back with AgNO<sub>3</sub> against a Ag electrode. Cd, Pb and Cu cannot be detd. in this way. H. JERMAIN CREIGHTON.

**Estimation of arsenic.** G. R. LYNCH. *Lancet* 203, 629-30(1922); *Analyst* 47, 535.—An outline is given of the different methods of estg. As, more especially in tissues. To obtain the As in a suitable form for the Marsh test, the tissue is heated with HNO<sub>3</sub>, the dry residue gently charred with H<sub>2</sub>SO<sub>4</sub>, heated and extd. with hot water, and the ext. filtered, reduced with SO<sub>2</sub> (the excess of which is removed by boiling) and concd. to 25-50 cc. Objection has been taken to the use of the electrolytic method devised by Thorpe, on the ground that the Pt electrodes may alter in their sensitiveness, with the result that mirrors of different size may be obtained from solns. contg. the same amts. of As. This change, however, is not a sudden one, and controls by means of fresh standards may be made from time to time. The sensitiveness of the Pt poles may be improved by passing the current through the app. reversed. Lead electrodes are more sensitive than those of Pt but the objection to their use is that the lead may possibly contain traces of As. The amt. of As is always evenly distributed throughout an organ such as the liver, and the intestines are the only parts in the body in which the content is liable to variation, this naturally occurring when the dose of As is passing through the alimentary canal. H. G.

**Determination of arsenic by means of hydrogen peroxide in arsenobenzene derivatives.** *Racem. Farm.* 1, 107-9(1922); *Chimie et industrie* 9, 491(1923).—Detn. of As by the iodometric method can be made rapidly and accurately by destroying the org. matter with concd. H<sub>2</sub>O<sub>2</sub> (30%). A. PAPINEAU-COUTURE.

**The action of hydrogen peroxide on the decomposition of plant and animal substances.** HÜSS. *Z. ges. Brauw.* 1922, No. 6, 44-6; *Expt. Sta. Record* 47, 713.—H<sub>2</sub>O<sub>2</sub> is suggested as a suitable agent to hasten the Kjeldahl process and at the same time prevent foaming. The directions for its use are as follows: Place 5 g. of the substance and 1 drop of Hg in a Kjeldahl flask with 25 cc. of 30% H<sub>2</sub>O<sub>2</sub>. Shake the mixt. well and cautiously add 40 cc. of concd. H<sub>2</sub>SO<sub>4</sub> in a thin stream. After the stormy reaction is over, heat the dark-brown liquid for 15 min. over a free flame, add 15-20 g. of K<sub>2</sub>SO<sub>4</sub> and continue the heating until the liquid is clear; this generally requires

25-30 min. Then dil. the soln. and distil off the  $\text{NH}_3$  as in the usual method.

H. G.

**Iodometric determination of aldose.** I. M. KOLTHOFF. *Pharm. Weekblad* 60, 362-75(1923).—Aldoses, unlike ketoses, are oxidized quant. to the corresponding acids by treatment with  $\text{NaIO}$ . The method of detn. consists in treating the aldose soln. with  $\text{I}_2$  in the presence of  $\text{NaOH}$  or  $\text{Na}_2\text{CO}_3$ . When  $\text{NaOH}$  is used, add at least twice the theoretical amt. of  $\text{I}$  and while shaking add the corresponding excess of alkali. After standing 5-10 min. acidify and titrate back with  $\text{Na}_2\text{S}_2\text{O}_3$ . When  $\text{Na}_2\text{CO}_3$  is used the soln. should stand 20-30 min. before titrating. In the presence of non-aldoses a correction should be made for the  $\text{I}$  consumed by these. With invert sugar the correction for fructose amounts to 1%. When titrating lactose in the presence of sucrose  $\text{Na}_2\text{CO}_3$  is preferable to  $\text{NaOH}$ .

A. W. DOX

**The determination of sulfur dioxide in chimney gases.** K. BALTHASER. *Chem.-Ztg.* 47, 225-6(1923).—Detailed directions are given for measuring the vol. of chimney gas, removing the condensed water and drying the gas, removing the smoke, ashes, etc., absorbing the  $\text{CO}_2$  and  $\text{SO}_2$  in  $\text{NaOH}$  soln., detg. the  $\text{SO}_2$  iodometrically and computing the results.

W. T. HALL

**A source of error in the determination of small amounts of carbon monoxide.** F. S. SINNATT and L. SLATER. *Fuel* 2, 241-3(1923).—The  $\text{I}_2\text{O}_5$  method for detg.  $\text{CO}$  in which the air is passed successively through  $\text{Br}$  in aq.  $\text{KBr}$ , concd.  $\text{KOH}$ ,  $\text{CaCl}_2$ ,  $\text{KOH}$  and  $\text{P}_2\text{O}_5$  was proved to give high results when the  $\text{CO}$  concn. is low. By various combinations in the adsorption train, it was proved that the absorption of the vapor arising from treatment of the air with aq.  $\text{Br}$  by concd.  $\text{KOH}$  forms some undetd. active compd. capable of liberating  $\text{I}$  when it comes in contact with  $\text{I}_2\text{O}_5$  at  $90-160^\circ$ . By this accepted method, 0.012%  $\text{CO}$  is recorded in air without any actually present. Animal charcoal between the last purifying column and the  $\text{I}_2\text{O}_5$  is unreliable because its absorptive capacity is limited. The  $\text{Br}$  in the purifying train should be replaced by 10% fuming  $\text{H}_2\text{SO}_4$  and the gas bubbled through  $\text{KOH}$  after this  $\text{H}_2\text{SO}_4$  treatment.

C. C. DAVIS

**Use of Schiff's reagent in the quantitative determination of acrolein.** C. MOUREU and E. BOISMENU. *J. pharm. chim.* 27, 49-54, 89-97(1923); cf. C. A. 15, 2481.—The use of Schiff's reagent ( $R$ ) permits colorimetric detn. of acrolein ( $A$ ) provided equal vols. of the soln. ( $A_1$ ) and the standard ( $A_2$ ) are compared, and the mixing of each with  $R$  takes place at the same instant, and at room temp. To enable this being done, tubular  $\Lambda$  shaped glass vessels are used, the stem parts being glass stoppered. Use 2 such vessels at one time; carefully put into 1 branch of each 10 cc. of the unknown  $A_1$ , or  $A_2$  ( $= 0.05\% A$ ), into the other 5 cc. of  $R$ , then mix by inverting the stoppered glasses simultaneously, and compare colors after 25 min. From known concns. of  $A$  as abscissas and intensities of color as ordinates, a graph was made, from which concns. may be read off after color intensities are detd. The method is accurate to 2%. In dilg. soln. of  $A$ , coloring ability with  $R$  diminishes faster than concn. The use of such stabilizers for  $A$  as pyrogallol, pyrocatechol, hydroquinol, gallic acid, tannin, does not interfere with the method described.

S. WALDBOTT

**Cremation and the legal recognition of poisons.** FRITZ LIPPICH. *Umschau* 27, 81-4(1923).—The stability of some of the poisons that occur in the body after death by poisoning and the effect on these poisons of the different modes of disinfection and preservation of cadavers are discussed. As all org. poisons would be burned and all mineral poisons which volatilize below  $1000^\circ$  would escape during cremation, legal restrictions of cremation are necessary in suspected murder cases.

L. W. RIGGS

Precipitation of metals by  $\text{H}_2\text{S}$  (SMITH) 6. Precision measurement of the composition of the constant-boiling mixture of  $\text{HCl}$  and  $\text{H}_2\text{O}$  (FOULK, HOLLINGSWORTH) 2.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY and EDW. F. HOLDEN

**Compressibility of minerals and rocks at high pressures.** L. H. ADAMS and E. D. WILLIAMSON. *J. Franklin Inst.* 193, 475-529(1923).—Detn. was made of the compressibility of a no. of minerals and igneous rocks under hydrostatic pressures as high as 12,000 megabars; the specimen was completely surrounded by kerosene, and subjected to pressure in a thick-walled steel bomb. The compressibility usually decreased slightly as the pressure was increased; although the change was so small for the less compressible

minerals that it escaped detection. In certain expts., porous rocks were covered with a thin jacket of pure Sn to prevent the kerosene from entering the pores; in these expts., at pressures above 2000 megabars, porosity had little effect on the compressibility. The more porous rocks, however, may show an abnormally high compressibility at low pressures. Except for very low pressures, the compressibility of a holocrystalline rock may be calcd. from the known compressibilities of its constituent minerals. The compressibility usually increases with increasing basicity. Of the igneous rocks, quartz and metallic Fe are the two extremes of compressibility. In any given class of rocks, variation in compressibility at high pressures is small and due almost entirely to variation in compn., while variation at low pressures is much larger and depends chiefly on the degree of compactness. At 10,000 megabars the compressibility per megabar is approx  $1.9 \times 10^{-6}$  for a typical granite and  $1.2 \times 10^{-6}$  for a typical gabbro. At this pressure, the rigidity of granite is  $0.3 \times 10^6$  megabars, gabbro  $0.5 \times 10^6$ , dunite  $0.6 \times 10^6$ ; the rigidity of the earth as a whole probably is approx.  $0.9 \times 10^6$ , a value higher than that of the most rigid silicate rock, this being doubtless produced by the pressure of a few hundred miles of rock on basic or ultrabasic rock. With increasing basicity, the velocity of the longitudinal vibrations, which are transmitted through the earth, increases from 5.6 km. per sec. in granite to 7.4 km. per sec. in dunite. Their initial velocity is slightly above 7 km. per sec. corresponding to a gabbro or a pyroxenite and showing the presence of basic or ultra-basic material at a comparatively small distance beneath the surface of the earth.

JOSEPH S. HEPBURN

**Synthetic precious stones.** R. QUENSEL. *Geol. För. Förh.* 44, 667-9(1922).—*Synthetic rubies and synthetic sapphires* have been successfully made from powd.  $Al_2O_3$  in the O-H flame. Coloring agents are discussed.

W. SEGERBLOM

**Remarkable specimens of copper and tin minerals from Katanga.** MAX LOEHST. *Ann. soc. géol. Belg. (Bull.)* 45, 76-7(1922); *Rev. géol.* 4, 22(1923).—A large specimen of native Cu, and several of cassiterite penetrated by tourmaline needles, are described.

E. F. H.

**Galena, ankerite, barite, and blende from Puertollano.** J. MÉLON. *Ann. soc. géol. Belg.* 45, 151-5(1922); *Rev. géol.* 4, 22(1923).—Galena crystals with 11 forms support large rhombohedrons of ankerite. Small barites, associated with pyrite and ferruginous blende, have a larger  $c:a$  ratio than usual.

E. F. H.

**Crystallographic notes on stephanite in a silver ore from Mexico.** E. V. SHANNON. *Proc. U. S. Nat. Museum* 63, 1-6(1923).—The material is probably from Sultepec, Mex. The crystals, which reach  $1.5 \times 0.4$  cm., are scattered through coarsely cryst. calcite and project into small cavities in a manner suggesting that the Ag mineral and its gang were deposited simultaneously. The only other Ag mineral in the specimens is polybasite. The stephanite is dark lead-gray in color and shows a brilliant conchoidal fracture with only traces of cleavage. Chem. tests showed Ag, Sb and S; As and Pb were proven absent. On 3 crystals measured in detail 39 forms were found, 7 new for the species.

L. W. RIGGS

**The alkali spinel of the Mansjö Mountain.** H. VON ECKERMANN. *Geol. För. Förh.* 44, 757-60(1922); cf. *C. A.* 16, 889, 2656.—Quant. analysis of blackish green spinel from Mansjö Mountain showed:  $SiO_2$  0.94,  $Al_2O_3$  57.80,  $Fe_2O_3$  3.04,  $FeO$  9.52,  $MgO$  24.76,  $CaO$  0.84,  $Na_2O$  1.38,  $K_2O$  1.31,  $H_2O$  0.00, sum 99.69%. These data were compared with those for ceylonite from Ceylon and for greenish black spinel from Franklin, N. J. For the analysis perfect spinel crystals not over 0.2 mm. were selected, ground, examd. with the microscope and washed with dil. HCl. The formula may be:  $MgO \cdot (Al, Fe)_2O_3 \cdot 84.7$ ,  $CaSiO_3 \cdot 1.7$ ,  $(Fe, Mg)O \cdot 10.9$ ,  $(Na, K)_2O \cdot 2.7$ ; or  $(Fe, Mg)O \cdot (Al, Fe)_2O_3 \cdot 89.0$ ,  $CaSiO_3 \cdot 1.7$ ,  $MgO \cdot 6.6$ ,  $(Na, K)_2O \cdot 2.7$ , sum 100.0%. E. thinks the latter more probable because of Mg in the pegmatitic Mansjö gneiss-granite. Errata in the article abstd. in *C. A.* 16, 2656 are noted.

W. SEGERBLOM

**Diaspore, libethenite, and several other minerals from Katanga.** G. CESÀRO AND M. BILLÈRE. *Ann. soc. géol. Belg. (Bull.)* 45, 172-81(1922); *Rev. géol.* 4, 21-2(1923).—The following minerals occur at Lualaba hill: corundum, diaspore in platy crystals., white mica of 2 optical types, rutile crystals., libethenite, and a *pseudomalachite*, probably of the compn.  $3Cu_3(PO_4)_2 + 8Cu(OH)_2$ .

E. F. H.

**Phosphorescence and luminescence in calcites.** WM. P. HEADDEN. *Am. J. Sci.* 5, 314-28(1923).—Failures to phosphoresce on insolation were due to atm. conditions. Phosphorescence is excited by the light of the Mo arc of wave length 3790 Å. U.; it may be delayed or entirely prevented by glass covers, red glass being most effective; sunlight and Mo-arc light act similarly in this respect. Haziness or cloudiness delays or prevents phosphorescence. Exposure in a mineral cabinet for 20 years caused abatement of phosphorescent intensity. The color of yellow calcites can be discharged

by heating to a temp. below that of decompn. of the  $\text{CaCO}_3$ . The purple calcite does not phosphoresce, but its color also can be discharged and its deportment toward heat changed without chem. decompn. Yellow calcite shows a thermophosphorescence between  $80^\circ$  and  $180^\circ$ , which is destroyed by heating to  $155^\circ$  for less than 8 hrs.; and a thermoluminescence at  $60^\circ$  to  $180^\circ$  which can be destroyed by heating to  $155^\circ$  for 36 hrs. It also phosphoresces on insolation. This property is destroyed by a temp. of  $155^\circ$  in 46 hrs.; it withstood a temp. of  $200^\circ$  for 1 hr., but was greatly weakened and the color was partially discharged. A temp. of  $250^\circ$  for 20 min. destroyed this property and discharged the color. Samples that have had their thermophosphorescence, thermoluminescence and photophosphorescence destroyed by heating to  $155^\circ$ , show a strong luminescence at  $300^\circ$  to  $400^\circ$ . The purple samples show a 2-phased luminescence. The duration of the luminescence at  $300^\circ$  to  $400^\circ$  is for the yellow 12 to 32, usually 18, min., and for the purple  $2\frac{1}{2}$  hrs. The color of all samples is discharged at  $300^\circ$  to  $400^\circ$ , and they become clear, transparent and lustrous. Powdering the samples lessened the period of luminescence. Yellow calcites in their natural condition phosphoresce for varying periods up to 1 hr. on exposure to the X-ray; this deportment was not changed by powdering and heating over a blast lamp for 30 min. The property of luminescence under the influence of the X-ray is common to all calcites examd. but the yellow calcite in its natural condition is the only one that shows a persistent phosphorescence. Luminescence at  $300^\circ$  to  $400^\circ$  is shown by most, but not by all calcites. L. W. RIGGS

**Albite from Katanga.** G. CESARO AND M. BELLIERE. *Ann. soc. géol. Belg. (Bull.)* 45, 184-8 (1922); *Rev. géol.* 4, 21 (1923).—The authors describe a curious rock composed essentially of albite imbedded in a yellowish brown substance sol. in warm HCl, with small amts. of hematite, rubellite, and mica. E. F. H.

**The cornetite from Bwana Mkubwa (Northern Rhodesia) and the formula of cornetite.** G. CESARO. *Ann. soc. géol. Belg. (Bull.)* 45, 102-8 (1922); *Rev. géol.* 4, 20 (1923).—A basic Cu phosphate from northern Rhodesia which was first described by Hutchinson and MacGregor is identical with cornetite. C. arrives at the formula  $\text{Cu}_3(\text{PO}_4)_2 \cdot 3\text{Cu}(\text{OH})_2$ , corresponding to pseudomalachite. The cryst. varieties of pseudomalachite are, however, entirely different from cornetite. E. F. H.

**Acrochordite, a new mineral from the Langban Mines.** G. FLINK. *Geol. För. Förh.* 44, 773-6 (1922); cf. C. A. 15, 3958; 16, 2650.—No. 1 of the list of the Langban minerals which need investigation is named "acrochordite" from *ακροχρῶδης*, a wart. It is found in the Japan workings of the Langban Mines as wart-like aggregations not over 7 mm. in diameter. Their physical appearance is described in detail. The very small individuals are reddish brown to yellow in color, subtranslucent, of velvety structure, and optically monoclinic. The axial plane is  $\perp$  the plane of symmetry, and  $Y \wedge c = 40^\circ$ , sign —. Its hardness = 3.5, sp. gr. = 3.194; no cleavage. It is easily and completely sol. in dil.  $\text{H}_2\text{SO}_4$ , the MnO going over to permanganate and coloring the soln. red; it loses water on heating and becomes grayish black. The compn. is:  $\text{As}_2\text{O}_5$  33.51,  $\text{P}_2\text{O}_5$  0.42, MnO 38.98, FeO 0.46, CaO 0.99, MgO 6.94,  $\text{K}_2\text{O}$  0.55,  $\text{Na}_2\text{O}$  1.18,  $\text{H}_2\text{O}$  16.78,  $\text{Mn}_2\text{O}_3$  0.50, sum 100.31%, indicating:  $\text{As}_2\text{O}_5 \cdot 4\text{MnO} \cdot \text{MgO} \cdot 6\text{H}_2\text{O}$  or  $\text{Mn}_3\text{As}_2\text{O}_{10} \cdot \text{MnOH} \cdot \text{MgOH} \cdot 5\text{H}_2\text{O}$ . The nearest mineral analogs are tyrolite and euchroite. W. SEGERBLOM

**The chemical composition of acrochordite.** G. K. ALMSTRÖM. *Geol. För. Förh.* 45, 117-8 (1923); cf. preceding abstract.—A. points out that Flink's samples were taken from small spherical aggregates which in their centers consisted of pyrochroite, somewhat changed to a black Mn compd., probably  $\text{Mn}_3\text{O}_4 \cdot \text{H}_2\text{O}$ . A. proposes that the mineral be considered a cryst. mixture of manganous arsenate with isomorphous Mg arsenate and smaller amts. of arsenates and phosphates of other elements. A. suggests the formula to be  $\text{Mn}_3\text{Mg}(\text{AsO}_4)_2 \cdot 6\text{H}_2\text{O}$ ; gives its structural formula; and points out that  $\text{Cu}_3(\text{AsO}_4)_2 + n\text{H}_2\text{O}$  is known as erinite, cornwallite and tyrolite, with  $n = 2.3$  to 9. W. SEGERBLOM

**Pandermitte occurrence at Sultan Tschair, western Asia Minor.** SCHLÖTHER. *Kali* 16, 190-5 (1922).—The geological, lithological and genetic features of this region on the south shore of the Sea of Marmora are described. Pandermitte appears to be formed in thick layers of gypsum beds. Shortly before the completion of deposition introduction of B exhalations occurred, resulting in the formation of pandermitte. L. W. RIGGS

**Celestite from the madrepore limestone of the province of Messina.** P. RANFALDI. *Atti accad. Lincei* 31, 430-3, 468-72, 506-8 (1922); *Rev. géol.* 4, 22-3 (1923).—Celestite crystals occur in limestone at the hill of Tremoli and in the Marro valley. E. F. H.

**The Blithfield meteorite.** R. A. A. JOHNSTON AND M. F. CONNOR. *Trans. Roy. Soc. Can.* 16 (Sect. IV), 187-94 (1922).—This meteorite, an irregular block avg.  $8 \times 10$

× 13.5 cm., and weighing about 1.9 kg. was found in the township of Blithfield, Renfrew Co., Ont., in 1910. In thin section it shows an interrupted network of Ni-Fe alloy enclosing irregular patches of enstatite. It contains silicates 75.16, troilite 11.94, daubréelite 0.64, graphite 0.16, schreibersite 0.20 and metal 12.80%. The metal contains: Fe 91.6, Ni 6.7, Co 0.4, Cu 0.08, Mn 0.01, Si 1.0, S 0.07, P 0.16%.

A. T. CAMERON

**Secondary processes in some Pre-Cambrian ore-bodies.** R. C. WALLACE. *Trans. Roy. Soc. Can.* 16 (Sect. IV), 169-74 (1922).—Study of the Flin-Flon and Mandy ore-bodies in northern Manitoba shows the primary mineralization to be pyrrhotite, pyrite, chalcopyrite, sphalerite, galena, bornite, and probably chalcocite. Oxidation products are limonite, hematite, melanterite, chalcantite, azurite, and malachite. Reduction products are covellite, native Cu, and doubtfully chalcocite. The starting place for the oxidation is pyrite. Native Cu is considered formed through the interaction of  $\text{CuSO}_4$  and  $\text{FeSO}_4$ , with subsequent deposition of Cu from  $\text{Cu}_2\text{SO}_4$ ; hydrolysis of the product  $\text{Fe}_2(\text{SO}_4)_3$  and pptn. of Cu permitting of continuous action. A. T. C.

**The metalliferous zones of Bottino and the valley of Castello, the minerals and mines.** A. PELLoux. *Mem. Soc. Lunigianese G. Capellini* 3, (1) 39-83 (1922); *Rev. géol.* 4, 73-4 (1923).—The region described has ores of Ag, Pb, Au, Hg, Zn, Sb, Fe, Mn.

E. F. H.

**Manganese deposits of east Tennessee.** G. W. STOSE AND F. C. SCHRADER. U. S. Geol. Survey, *Bull.* 737, 149 pp. (1923).—Most of the Mn ores found in this section are oxides, but a carbonate ore occurs at East Fork. The ore is mined by open cut, and washed usually in log washers. Dry mined ore is hand-picked from slowly moving belts. Upwards of 130 Mn mines and prospects in the belt along the eastern border of Tenn. are described by counties. The deposits as a whole are estd. to contain 85,000 t. of fairly accessible ore, and many of the deposits may be larger than estd.

L. W. RIGGS

**The tin ores of the island of Flores.** A. WICHMANN. *Versl. Akad. Wetenschappen Amsterdam* 27 (Pt. 1), 60-8 (1919); *Rev. géol.* 4, 73 (1923).—Flores, in the Timor archipelago, Dutch Indies, does not contain Sn minerals in appreciable quantities. E. F. H.

**Economic geology of the Summerfield and Woodsfield quadrangles, Ohio.** D. D. CONDIT. U. S. Geol. Survey, *Bull.* 720, 151 pp. (1923).—The av. yearly production of coal in 8 counties in eastern Ohio during 1910-9 was 20 million t. The coal of these quadrangles is comparatively high in moisture, ash and S, and low in heating value. The moisture averages 4.5%, ash above 12, S 3.0 and B.t.u. 12,000. Practically all of the Woodsfield quadrangle is underlain by Pittsburgh coal 4 to 5 ft. thick and as yet almost untouched. Sectional descriptions of coal beds in various mines are given. Beside coal this area contains much limestone, which for the most part contains Mg and is therefore unsuitable for the manuf. of Portland cement, but excellent for surfacing roads. The geology of 26 townships in this region is described.

L. W. RIGGS

**Structure and oil and gas resources of the Osage Reservation, Oklahoma.** DAVID WAITE, et al. U. S. Geol. Survey, *Bull.* 686, 420 pp. (1922).—The imperative need for an increased petroleum supply during the war drew particular attention to this field in northern Okla. because (1) it contains a great acreage of unleased oil lands, (2) the productivity of the developed areas is high and well sustained, (3) anticlines and domes are numerous in the greater part of the area and tests indicate that most of the structurally favorable fields will yield oil, (4) the oil is of paraffin grade, mainly 35° to 36° Bé., yielding about 23% of gasoline in present practice but capable of producing over 50% by the best methods, (5) pipe lines and refineries are already at hand, and (6) leases of quarter sections are being offered by hundreds to openly competitive bidders on advertised dates. The stratigraphy, structural features, exposed and unexposed rocks, and areas of structure favorable or unfavorable for oil are described for about 50 townships in this region.

L. W. RIGGS

**The origin of petroleum.** H. HÖFER-HEIMHALT. *Petroleum Z.* 19, 191-3 (1923).—A summary of the Engler-Höfer theory of petroleum origin.

D. F. BROWN

**Suggestive evidence on the origin of petroleum and oil shale.** J. C. JONES. *Oil Eng. & Finance* 3, 443-4, 452 (1923).—Examn. of deposits in Nevada indicate that oil shales originate as fresh-water muds contg. a high % of spores, algae and other non-woody material which has been partially decomposed by bacterial action, but not sufficiently to raise appreciably the relative proportion of fats, through removal of the other plant substances. The origin of petroleum is muds, sands and calcareous muds deposited in saline waters and contg. a considerable % of org. matter, largely algal in origin, but may in special instances consist chiefly of other plant and animal remains so thoroughly

decomposed through bacterial action that the fats form a relatively high % of the org. matter remaining.

D. F. BROWN

**Significance of the west Galician petroleum deposits.** K. FRIDEL. *Petroleum Z.* 19, 185-91(1923); cf. C. A. 16, 4332.—The deposits lying in the area between Sambor and Turka in the east and Krakau and Neumarkt in the west are described. The oil-bearing stratum is chiefly the "Flyschzone" of the Carpathians which is unusually broad here. The theory is developed that from the geological structures in this region the oil did not originate in this layer but migrated to it from below. There is little prospect of locating in this section oil wells comparable to the Borslaw fields.

D. F. BROWN

**The Albanian petroleum fields.** E. NOWACK. *Petroleum Z.* 19, 255-69(1923).—A detailed description of the geological structures found in Albania, especially as regards their relation to the occurrence of petroleum, is given.

D. F. BROWN

**A leptite sandstone-like arkose at the Stortjärn Ridge.** H. VON ECKERMANN. *Geol. För. Förh.* 44, 750-6(1922).—The ridge consists mainly of red pegmatite gneiss-granite rich in microcline. The arkose is a compact light red leptite resembling sandstone and somewhat pressed. A section showed ridge-like structure with large sharp-edged granules of quartz, microcline and plagioclase in a fine ground-mass of rather pure quartz. The compn. at the bottom was: SiO<sub>2</sub> 78.28, TiO<sub>2</sub> 0.06, Al<sub>2</sub>O<sub>3</sub> 11.27, Fe<sub>2</sub>O<sub>3</sub> 0.00, FeO 1.79, MnO 0.00, CaO 0.62, MgO 0.22, Na<sub>2</sub>O 2.96, K<sub>2</sub>O 3.88, H<sub>2</sub>O 0.00, H<sub>2</sub>O 0.15, sum 99.23%, indicating 22 microcline, 33 plagioclase and 45% quartz. The compn. at the top was: SiO<sub>2</sub> 83.19, TiO<sub>2</sub> 0.03, Al<sub>2</sub>O<sub>3</sub> 8.31, Fe<sub>2</sub>O<sub>3</sub> not detd., FeO 1.52, MnO not detd., CaO 0.58, MgO not detd., Na<sub>2</sub>O 1.92, K<sub>2</sub>O 2.79, H<sub>2</sub>O 0.10, H<sub>2</sub>O 0.41, sum 98.85%, indicating 16 microcline, 22 plagioclase and 62% quartz.

W. SGERBLOM

**Petrographic and chemical observations on the hälleflintas of the Dannemora mining field.** E. NYSTRÖM. *Geol. För. Förh.* 44, 760-72(1922).—Most of the rock at Dannemora is porphyritic hälleflinta, gray, with dark semitransparent quartz phenocrysts not over 1 mm. in diameter. Its compn. is: SiO<sub>2</sub> 73.24, TiO<sub>2</sub> 0.12, Al<sub>2</sub>O<sub>3</sub> 12.75, Fe<sub>2</sub>O<sub>3</sub> 2.98, FeO 3.14, MnO 0.16, MgO 1.41, CaO 0.34, Na<sub>2</sub>O 0.49, K<sub>2</sub>O 3.67, P<sub>2</sub>O<sub>5</sub> 0.04, H<sub>2</sub>O (105°) 1.19, sum 99.53%, indicating a highly acid porphyry rich in quartz and K<sub>2</sub>O. The striped hälleflinta is black and white, red and black, green and black, or dark and light gray, the last being most common. The light colored stripes consist of very minute irregular particles of quartz and feldspar with agglomerates of small crystals of zoisite distributed throughout the mass. The dark stripes consist of banded zones of darker and lighter gray, mostly feldspar with specks of muscovite and invisible phenocrysts of quartz. The light stripe contained: SiO<sub>2</sub> 73.68, TiO<sub>2</sub> 0.12, Al<sub>2</sub>O<sub>3</sub> 12.67, Fe<sub>2</sub>O<sub>3</sub> 1.96, FeO not detd., MnO 0.00, MgO 0.39, CaO 3.52, Na<sub>2</sub>O 1.29, K<sub>2</sub>O 6.22, P<sub>2</sub>O<sub>5</sub> not detd., CO<sub>2</sub> 0.16, H<sub>2</sub>O (105°) 0, sum 100.01%. The dark stripe contained: SiO<sub>2</sub> 76.85, TiO<sub>2</sub> 0.09, Al<sub>2</sub>O<sub>3</sub> 11.39, Fe<sub>2</sub>O<sub>3</sub> 1.81, FeO not detd., MnO 0.09, MgO 1.04, CaO 2.26, Na<sub>2</sub>O 0.49, K<sub>2</sub>O 5.98, P<sub>2</sub>O<sub>5</sub> and CO<sub>2</sub> not detd., loss on ign. 0.44, sum 100.44%. The felsite porphyry is dark gray or brownish, dense, and with flinty fracture, apparently irregularly placed crystals of feldspar and quartz, with patches of biotite and muscovite, and with quartz phenocrysts. The compn. is: SiO<sub>2</sub> 70.84, TiO<sub>2</sub> 0.09, Al<sub>2</sub>O<sub>3</sub> 15.00, Fe<sub>2</sub>O<sub>3</sub> 0.79, FeO 1.56, MnO 0.24, MgO 0.18, CaO 0.52, Na<sub>2</sub>O 2.26, K<sub>2</sub>O 4.48, P<sub>2</sub>O<sub>5</sub> trace, H<sub>2</sub>O (105°) 0.52, sum 100.48%, indicating a highly acid and rather quartzose rock resembling porphyritic hälleflinta. Hälleflintas seem to be of 3 kinds, one rich in Na, one rich in K, and one intermediate.

W. SGERBLOM

**Mineralization along the dikes of Southern Vermont.** H. G. BRAY AND A. H. EMERY. *Ohio J. Sci.* 23, 83-8(1923).—"The two types of complementary dikes found in this region of southern Vermont, of diorite and quartz and quartz-feldspar, are accompanied by extensive mineralization. The type of alteration found in the country rock near the contacts is much the same in many respects for both kinds of dike. The quartz and quartz-feldspar dikes, however, have much the longer list of minerals resulting from mineralization since the more volatile constituents of a magma seem to accompany the acidic rather than the basic sub-magmas. The common minerals thus formed are hornblende, actinolite, tourmaline, biotite, muscovite, phlogopite, paragonite, pyrite, magnetite, ilmenite and others."

L. W. RIGGS

**Important equilibrium solutions of ocean salt deposits at 83°.** SEROWY. *Kali* 16, 206-13, 225-33, 247-54, 271-8, 291-7, 313-20(1922).—This extensive study of the solid contents of sea water under varying conditions shows the mol. relations of NaCl, KCl, MgCl<sub>2</sub>, MgSO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub> and the relations of their ions. The data are assembled in 27 large tables and are illustrated by 46 charts of curves. Many synthetic mixts. of part or all of the above named salts were studied.

L. W. RIGGS

**Glaserthalite.** C. RÖHLB. *Kali* 16, 89-90(1922).—A boring in the Gross-Rhude

field of the Marienburg district pierced a layer of kainite-hardsalt extending from 297 to 312 m. in depth, and a layer of carnallite extending from 312 to 357 m. An av. of 5 samples of the drill core in the kainite-hardsalt layer contained:  $K_2O$  12.98,  $Na_2O$  32.39,  $MgO$  2.27,  $CaO$  0.99,  $Cl$  35.87,  $SO_4$  17.75, insol. 0.92,  $H_2O$  5.04%. These figures indicate that Na and K occur as sulfates. Apparently the core is  $2/3$  NaCl and about  $1/3$  a mineral of sp. gr. between 1.58 and 1.72, optically uniaxial, reacting for K and SO and having the properties of glaserite.

L. W. RIGGS

**Summary of mineral production in foreign countries in 1919 and 1920.** L. M. JONES. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Pt. I, 513-64 (preprint No. 29, published April 26, 1923).

E. H.

**Chemical composition of living matter and the chemistry of the earth's crust.** W. J. VERNADSKY. *Rev. gen. sci.* 34, 42-51 (1923).—An address on geochemistry delivered at Petrograd, June 22, 1922.

L. W. RIGGS

**Catalog of Swedish geological, paleontological, petrographic and mineralogical literature for 1921.** FR. E. AHLANDER. *Geol. För. Förh.* 44, 777-82 (1922); cf. C. A. 16, 2830.—A list of 110 papers arranged alphabetically by authors. Many are in English, and some are chemical in nature.

W. SEGERBLOM

**Methoxyl content of decaying vegetation (FISCHER, et al.) 21.** Behavior of cellulose and lignin during decay (FISCHER, et al.) 21. Elk Hills oil field, Calif. (WAGNER) 22. Radioactive minerals of Sardinia (PUXEDDU, MARINI) 3. The Röntgenometric methods for the determination of crystal structure (GROSS) 2. Crystal habit and temperature (SEIFERT) 2.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

**The development of the flotation process for the treatment of ores.** B. SIMMERS-BACH. *Dinglers polytech. J.* 338, 1-5, 13-6, 23-7 (1923).—Historical and descriptive.

C. C. DAVIS

**The treatment of vanadiferous iron ores.** BJUNKJENBERG. *Edel-Erden u. Erze* 4, 28 (1923).—Magnetite and ilmenite ores contain appreciable quantities of V and Ti. If the ore contains little Ti, and over 60% Fe and 1.5% V, it is smelted for Fe, and the V recovered from the slag. If V is low, and Ti high, the ore is treated with crude  $H_2SO_4$ . The Fe and Ti sulfates are roasted and used as red ochre, which has better color and covering strength than that prepd. from pyrite. The V is recovered from the oxides by NaOH leaching and pptn.

E. F. HOLDEN

**Metallurgical applications of physical chemistry.** C. H. DESCH. *J. Chem. Soc.* 123, 280-94 (1923).—A few topics have been selected to indicate the large field for cooperation between the phys. chemist and the metallurgist.

V. O. HOMERBERG

**The metallurgy and economics of the Hollinger and of the New Modderfontein.** A. W. ALLEN. *Eng. Mining J.-Press* 115, 667-9 (1923).—These two gold mines and mills, one in Canada and one in South Africa, are compared as to history, metallurgical practice, and costs.

A. BUTTS

**Metallurgy of mercury. III.** ALDO ANTONAZ. *Giorn. chim. ind. applicata* 5, 73-5 (1923); cf. C. A. 17, 1407.—The influence of the capacity of Spirek furnaces in the Idria plant for working Hg ores is as follows: Furnaces of large capacity always give better economic results than do furnaces of small capacity, although small furnaces give a higher yield of Hg. This economic result is appreciably superior for rich ores, slightly so for poor ores.

ROBERT S. POSMONTIER

**Cobalt, its production and uses.** C. W. DRURY. *Trans. Am. Electrochem. Soc.* 43, preprint (1923).—A brief and general description of the ores, metallurgy and uses. Canada is the chief producer. The world's consumption is 400 tons. Chief uses are in stellite, in ceramic industries, to impart high retentivity to permanent magnets, as driers in paint and varnish, and as a catalytic agent in the oxidation and hydrogenation of oils. The metallurgy is chiefly a complex wet extrn. by treating ores or a speiss with dil.  $H_2SO_4$ , and by pptn. of  $Co(OH)_2$  by addn. of hypochlorite soln. after removal of impurities.

CHAS. H. ELDRIDGE

**Ductile tantalum.** C. W. BAKER. *Ind. Eng. Chem.* 15, 560-2 (1923).—A review of the prepn., properties and uses of Ta.

E. H.

**Iron ore, pig iron and steel in 1921.** E. F. BURCHARD AND H. W. DAVIS. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Pt. I, 565-97 (preprint No. 30, published April 23, 1923).

E. H.



Notes on the selection of a copper-smelting plant. W. A. HAYWOOD. *Bull. Inst. Mining Met.* 1923, No. 223, 9 pp.—Plant design is discussed from the standpoint of type of ore, size, and costs. Reverberatory smelting is favored over blast-furnace only where a large part of the ore is finely divided, or where coal or oil is much cheaper than coke, or where water is scarce.

Recently rebuilt blast furnace Lorain No. 4, National Tube Co. ANON. *Blast Furnace and Steel Plant* 11, 269-71 (1923).—Important improvements are described.

The laboratory of the Schneider plant at Harfleur. SCHNEIDER & Co. *Rev. métal.* 20, 73-87 (1923).—A very detailed description of the equipment and of the work carried out. The lab. is used in control work and in research work in the manuf. of artillery, munitions, elec. and internal-combustion motors and the repair of locomotives.

Effect of temperature on some of the properties of steel. H. R. A. MALLOCK. *Proc. Roy. Soc. (London)* 103A, 1-7 (1923).—In an app. by which the period of oscillation, the temp. and the length of a steel wire were continuously recorded during heating or cooling it was found that (a) there occurs a small and gradual decrease in the rigidity of the steel up to a dull red heat and a rapid decrease above the crit. temp. and (b) the rate of expansion shows no sudden change at that temp. Since the expansion from 0° to 1000° can be approx. represented by a straight line this property might be used thermometrically. It is concluded because of the constancy of the rate of expansion while passing through the crit. range that the change in the exponential coeff. of the cooling curve for steel must be due to a change in the sp. heat while passing from the hot to the cool allotropic form.

The segregation of phosphorus in ingot steel. O. BAUER. *Mitt. Materialprüfung-samt.* 40, 71-88 (1923).—A discussion of the injurious effect resulting from the segregation of P in steel.

Improvement in crusher steel is suggested by metallographic tests. O. E. HARDER. *Eng. Mining J. Press.* 115, 314-8 (1923).—Examn. of failures of mine and mill equipment indicates that sufficient attention is not given to heat-treatment in the process of manuf.

Fatigue failure of metals. C. F. JENKIN. *Proc. Roy. Soc. (London)* 103A, 121-38 (1923).—A theory is offered to explain the mechanism of fatigue failure up to the yield point in which the novel assumptions are that some of the crystals are initially stressed, and that the fatigue range is the same as the elastic range. It does not explain the effect of test speed or deviations from Hooke's law. It has been applied only to wrought Fe, steel, Ni, and Cu, and is probably not applicable to brittle metals.

The behavior of metals under repeated stress. P. LUDWIG AND R. SCHUB. *Z. Ver. deut. Ing.* 67, 122-6; *Z. Metallkunde* 15, 68-72 (1923); cf. *C. A.* 16, 1382.—A report of the results obtained from fatigue expts. carried out on torsion, bending and impact machines.

Essential factors relating to cold-work and recrystallization according to experiments with metallic bodies prepared from powdered materials. F. SAUERWALD. *Z. Elektrochem.* 29, 79-85 (1923); cf. *C. A.* 16, 3845.—The influence on grain growth of cold work prior to heating has been studied. Expts. were carried out with specimens prepd. by subjecting powd. Fe and powd. Cu to pressures of 1500 and 5000 atms. The specimens were then heated to 750° and 1070° in an atm. of H, next subjected to a 60% compression with a pressure of 10,000 atm., and afterwards heated to a no. of temps. between 420° and 1075° in an atm. of H. The grain growth was observed after each heating. The effect of the cold-work prior to the heat treatment is to lower markedly the temp. at which grain growth starts. This temp. is lower the greater the degree of deformation. The influence of cold-work on the state of vibration of the atoms is discussed. Since owing to the cold-work a part of the atoms acquires greater amplitudes, it should be possible to deduce a relation between the amt. of work and the temp. of recrystn.

A metallographic study of tin amalgams. F. HAUSER. *Z. Physik* 13, 1-6 (1923).—The structure of a Sn amalgam having the compn. Hg-Sn is similar to that of a Cu-Sn alloy. At room temp. the amalgam consists of solid crystals in a fluid filling. The liquid portion of the amalgam was sepd. by centrifuging.

Heat treatment of steel castings. F. C. LANGENBERG. *Iron Age* 111, 397-400 (1923).—Methods of improving phys. properties and the bearing on specifications are discussed. The effect on impact values of elec. and open-hearth steel is considered.

Controlling cast-iron hardness. S. J. FELTON. *Foundry* 51, 321-2 (1923).—

Metallographic study showing the different constituents indicates the causes of hardness. Control methods are outlined. Close-grained Fe is not likely to be porous but has large internal shrinkage. V. O. HOMERBERG

Ball hardness and scleroscope hardness. HUGH O'NEILL. *Nature* 111, 430-1 (1923). E. J. C.

Effect of annealing gray iron. J. F. HARPER AND R. S. MACPHERRAN. *Foundry* 51, 177-80 (1923).—Test bars heated at different temps. for various lengths of time show changes in strength and hardness caused by annealing. The results are charted and micrographs shown. V. O. HOMERBERG

Performance of high-speed cutting tools. JEROME STRAUSS. *Iron Age* 111, 1103, 1150-1 (1923).—Milling cutters of forged and cast high-speed steel and special compns. are compared. The method of detg. relative merit value is given. V. O. HOMERBERG

Dial copper and twelve percent watch nickel. WM. B. PRICE. *Metal Ind.* 21, 104-5, 148 (1923).—A description is given of the manuf. of these products from the raw material to the finished product. V. O. HOMERBERG

To paint or galvanize steel structures. ANON. *Elec. World* 81, 961-5 (1923).—Results of a questionnaire on this debated subject give no conclusive answer. The article is of particular interest to the chem. engineer. C. G. F.

Corrosion of brass in sea water. II. L. BELLADEN. *Met. ind.* 14, 119-25 (1922); cf. *C. A.* 16, 893.—This article is not readily abstracted. The topics are: (1)  $\alpha$  brasses; (2) brasses with constituents  $\alpha + \beta$ , and pure  $\beta$  brasses; (3) corrosion of  $\gamma, \beta$  brasses, (4) considerations on corrosion of brasses. Eleven photomicrographs are given. ROBERT S. POSMONTIER

An investigation of the rusting and solubility in acid of two rail sections. O. BAUER. *Mitt. Materialprüfungsamt* 40, 65-71 (1923).—Two sections of rails were taken from the same part of the road-bed. One had been in use for 50 years; the other for 25 years. The web of the newer rail had rusted almost through; that of the older rail had rusted only slightly. The only differences of any importance between the analyses of the 2 rails were in the C and Si contents. The old rail contained 0.21% C and 0.5% Si and the new one 0.43% C and 0.12% Si. Metallographic examn. showed both rails to be free from segregation. Sections from both rails were immersed in distd. water, in 1% NaCl soln., and in 1%  $H_2SO_4$  soln. Other specimens were exposed to the atm. on the roof of the lab. In all these expts. the newer rail lost wt. by soln. or rust formation much more rapidly than the older rail. No explanation of this difference in rate of rusting is offered. F. P. FLAGG

The electromotive behavior of some binary alloys. IX. Alloys of magnesium with lead and cadmium. R. KREMANN AND J. GMACHL-PAMMER. *Z. Metallkunde* 12, 358-63 (1920); cf. *C. A.* 15, 2771. X. The potential of magnesium-bismuth alloy. R. KREMANN AND H. EITEL. *Ibid* 363-5. XI. The alloys of magnesium with tin and antimony. R. KREMANN AND H. RUDERER. *Ibid* 403-6. XII. The alloy of zinc and magnesium. R. KREMANN AND R. MÜLLER. *Ibid* 411-3. XIII. The mercury-sodium alloys. R. KREMANN AND K. BATTIG. *Ibid* 414-24. XIV. The alloys of potassium with mercury, cadmium and zinc. R. KREMANN AND A. MEHR. *Ibid* 444-55. XV. Alloys of potassium with lead, tin and thallium and of sodium with antimony. R. KREMANN AND E. PRESSFREUND. *Ibid* 13, 19-29 (1921). XVI. Alloys of bismuth with sodium and potassium. R. KREMANN, J. FRITSCH AND R. RIEDL. *Ibid* 66-73. XVII. Antimony-selenium alloys and their metallographic investigation. R. KREMANN AND R. WITTEK. *Ibid* 90-7. E. J. C.

Nature of solid solutions (BAIN) 2. Density of molten Ag (HOFFMANN, STAHL) 2. Uni-crystalline W (VAN ARKEL) 2. Investigations of uni-crystalline wires of tin (MARK, et al.) 2. Electrical precipitation in chloride volatilization process (VARLEY, CLARK) 4.

Treating lead-zinc ore. E. H. SNYDER. U. S. 1,453,289, May 1. Ore contg. Pb, Zn and S is roasted to form a product rich in  $PbSO_4$  and ZnO and the latter is mixed with NaCl or other chloride of an alkali-forming metal in an amt. at least chem. equiv. to the Pb present. The mass is then heated in a non-reducing atm. to 750-1100° to form and volatilize  $PbCl_2$  and sep. it from the residue of ZnO.

Recovering zinc from zinc-lead ores. R. V. SMITH. U. S. 1,452,662, Apr. 24. Crushed Pb-Zn ore is sulfidized in a slightly alk. pulp., treated to recover the Pb, e. g., by flotation, and the tailings are resulfidized in a pulp rendered acid by HOAc, formic acid or other organic acid and the Zn is recovered by flotation.

**Purification of molybdenum.** KISABURO TANAKA and YASUNORI MOCHITA. Japan. 41,133, Dec. 19, 1921. Mo is isolated from molybdenite by the thermite process. The powd. mineral is heated during 30 min. at red heat for partial oxidation until the material assumes the form of black scales. Ten parts of the heated product are mixed with 3 parts of powd. Al and burned, a mixt. of  $\text{KClO}_4$ , Mg and Al being used. The reduced Mo is absorbed into the excess of Al, by which the evapn. of the oxides of Mo is prevented. The content of Fe in the product does not exceed 1-2%.

**Sponge iron.** F. B. THORNHILL. U. S. 1,452,626-7, Apr. 24. Fe ore to be reduced to sponge Fe is passed over a non-heating supporting hearth in a reducing chamber and heated together with carbonaceous material by heat radiated from a source out of contact with the mixt., *e. g.*, carborundum heaters with internal burners. Cf. C. A. 17, 1207.

**Ferrous metals from scrap.** J. A. WILLIAMS. U. S. 1,453,057, Apr. 24. Fe or steel scrap is oxidized to produce Fe oxide in finely divided form, the oxide is reduced to powd. metallic Fe and the latter is subsequently worked up into solid Fe, steel or alloys.

**Aluminium alloys.** A. B. NORRON. U. S. 1,453,254, Apr. 24. Alloys of Al with other metals of higher m. p. such as Cu and Fe are prepd. by melting the Al, adding solid metal of higher m. p., *e. g.*, Fe, and then adding a high-melting metal, *e. g.*, Cu, in a molten state.

**Alloys of infusible metals and copper.** HAN NAKANE. Japan. 40,864, Nov. 30, 1921. Alloys of Cu with Mo, W, and Ti are prepd. by the thermite process. 60-85% of the Cu wanted for the alloy is used as metallic powder, the remainder as the oxide, and the infusible metals are as oxides or Ca salts of their acids. *E. g.*, a thoroughly dried mixt. of 314 kg. of Ca tungstate, 300 kg. of  $\text{CuO}$ , 560 kg. of Cu powder and 128 kg. of Al powder are put into a crucible and heated until the reaction occurs. The product is an alloy of 20% W and 80% Cu. The slag produced floats on the alloy.

**Alloy for turbine wings.** ICHIRÔ IITAKA and THE MITSUBISHI ZÔSEN KAWUSHIKI KAISHA. Japan. 40,903, Dec. 1, 1921. Besides Cu the alloy contains 3-8% Ni, 5-6% Al and 1-3% Fe, the combining ratio of Cu and Al being 90-96%, that of Fe and Ni 4-10%, and that of Ni and Al 10-13%. The strength of the alloy is 35-45 tons per sq. in. and the elongation 30-60%.

**Readily fusible alloy.** A. DEW. MULLIGAN. U. S. 1,452,750, Apr. 24. See Brit. 185,012 (C. A. 17, 719).

**Steel polishing pebbles.** H. L. BEAVER. U. S. 1,453,120, Apr. 24. Heteromorphic asymmetrical polished steel particles are formed with projections adapted to make angular contact with projecting portions of a metal surface to be polished.

**Annealing sheet iron.** J. A. SMAIL. U. S. 1,453,411, May 1. A pack of Fe sheets is brought up through an annealing temp. in a closed chamber and then allowed to cool while still closed from the outside atm.

**Coating molds for metal casting.** D. H. MELOCHE. U. S. 1,453,593, May 1. Molds for casting ferrous metals are lined with a smooth adherent coating formed of fire clay with a binder of sol. silicate.

**Welding rod.** F. M. BECKETT. U. S. 1,452,781, Apr. 24. An Fe alloy contg. C and Mn and Si, *e. g.*, C 0.05-0.50%, Mn 0.5-1.75% and Si 0.3-1.5%, is used for making welding rods adapted for use in elec. arc welding.

**Soldering flux.** H. A. PALLADY. U. S. 1,453,080, Apr. 24.  $\text{ZnCl}_2$  44.44, amalgamated Sn 33.33,  $\text{NH}_4\text{Cl}$  21.9 and glycerol 0.33 parts.

**Soldering flux.** E. M. HEARNE. U. S. 1,453,586, May 1. A mixt. of charcoal, Fe oxide and rosin.

**Zinc-coating apparatus.** IWAKICHI SHIMIZU and HEIICHI SUGI. Japan. 40,901, Dec. 1, 1921. Plates to be covered with Zn are gradually dipped into a melted Zn bath through rolls. At the place of delivery a series of burners is fixed, by which the surface of the coated metal is smoothed.

**Fusing kettle for zinc.** DAIZO KUBOTA. Japan. 40,936, Nov. 30, 1921. By a suitable water jacket the surface of the melted Zn is cooled so that while the material in the bottom is liquid the upper part is semi-solid and oxidation of the metal is prevented.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROULLER AND CLARENCE J. WEST

Paul Jacobson. C. HARRIES. *Z. angew. Chem.* **36**, 209-10(1923).—Obituary. E. H.

**History of xylose, its discovery and methods of preparation.** T. SWANN HARDING. *Sugar* **25**, 124-5(1923).—A review of the methods used by previous workers is presented. A yield of 12% of xylose may be obtained by hydrolyzing 1 kg. corn cobs with 6 l. of 4%  $H_2SO_4$  for 2 hrs. By adding half the acid used first to the liquor, a second kg. of cobs may be hydrolyzed. The filtrate is neutralized near the b. p. with  $BaCO_3$ , using Congo red paper. After filtering off the  $BaSO_4$  and decolorizing with C, the filtrate is concd. *in vacuo* to a thin sirup. Two vols. of alc. added at this point will remove many of the impurities. The sirup is carried to a thick state and crystn. proceeds rapidly. One % concd.  $HNO_3$  in the wash alc. gives a very white sugar. C. H. CHRISTMAN

**History of galactose, its discovery and methods of preparation.** T. S. HARDING. *Sugar* **25**, 175-7(1923).—A bibliographic presentation of the early history of galactose. To obtain a pure galactose the method of Clark (*C. A.* **15**, 2628) is recommended. C. H. CHRISTMAN

**Preparation of aromatic chloromethylene derivatives.** G. BLANC. *Bull. soc. chim.* **33**, 313-9(1923).—See *C. A.* **17**, 1630. W. O. E.

**The preparation of true acetylene hydrocarbons.** M. BOURGUEL. *Compt. rend.* **176**, 751-3(1923).— $NaNH_2$  has been found superior to NaOH or Na in prep.  $C_2H_2$  by removal of halogens in that polymerization and isomerization are reduced, yields are increased, and the products are purer. The reaction is best carried out by dropping the halogen deriv. upon well pulverized  $NaNH_2$  suspended in  $C_2H_6$ ,  $PhMe$ , or  $C_2H_5Me$ ; the reaction is violent, but more regular if the temp. be high at the start, and then brought slowly to the b. p. of the solvent. The  $NH_3$  evolved is collected and detd. as a control; the evolution is generally complete in 2.5 hrs.; when 2 mols.  $NH_3$  are given off for each mol. of dibromide, then the  $C_2H_2$  is found pure, but when an appreciable amt. of NaOH is present in the  $NaNH_2$ , formation of a Na deriv. of the hydrocarbon takes place, a larger proportion of  $NH_3$  is evolved, and the main product no longer gives the usual ppt. with  $NH_4-Cu_2Cl_2$  (cf. Picon, *C. A.* **15**, 3611).  $MeOCH_2C:CH$  was prepd. from the dibromide in 61% yield, using coarser  $NaNH_2$  and  $EtOCH_2C:CH$  in 81% yield with finer  $NaNH_2$ ; distn. with a good column sufficed to obtain these compds. in very pure form.  $C_2H_3C:CH$  from  $PhCBr:CHBr$ , was prepd. in 70% yield; the KOH process gave a 40-50% yield of less pure product. The Na deriv., by reaction with a large excess of  $NaNH_2$  contg. NaOH, is advantageously prepd. in this case for permit of removing any  $PhC:CMc$  or  $PhEt$  by washing it with dry  $Et_2O$ ; and in the case of  $C_3H_7C:CH$  (I) to remove  $EtC:CMc$  by volatilization; the Na deriv. of I is decomp. as usual with ice, then acidified, and distd.; yield, 38%, b. 39.6-40°. A. R. ALBRIGHT

**Mechanism of the reaction in the double decomposition of the alkyl halides.** ADOLF FRANK and RUDOLF DWORZAK. *Monatsh.* **43**, 661-71(1923).—In order to test the theory proposed in *C. A.* **8**, 501, that the sapon. of a dibromide to a glycol proceeds through the formation of an unsatd. compd., the behavior of an optically active compd. has been studied. Since the action of NaOH upon the alc. as well as upon the iodide gave a practically inactive compd. no conclusions can be drawn. Active *sec-butylbromide*, b. 89-91°,  $[\alpha]_D^{20}$  6.36°. The action of KSH upon both the I and Br derivs. gave the active *mercaptan*,  $[\alpha]_D^{20}$  12.45°, identified as the *Hg compd.*  $C_4H_9SHgCl$ , columns which do not m. but turn yellow on heating. The *mercaptan* from  $BrCH_2CMc_2CH_2Br$  was isolated as the compd.  $C_4H_9S_2HgCl_2$ . C. J. WEST

**Oxidation of Cadet's liquor; preparation of cacodylic acid.** H. GUINOT. *J. pharm. chim.* **27**, 55-64(1923).—An almost quant. yield of cacodylic acid (I) is obtained by oxidizing Cadet's liquor (II) under  $H_2O$  with the calcd. amt. of Javel soln. dild. in 2 vols. of  $H_2O$  and in presence of the calcd. amt. of  $HCl$  required for its decompn. Sepn. of I from NaCl was effected with hot 96%  $EtOH$ . Or, dissolve II in acetone or  $MeEtCO$  dild. with the calcd. amt. of  $H_2O$  and oxidize with  $O$ , which is rapidly absorbed at first; with more  $H_2O$  added after equil. is reached, again as much  $O$  as before will be absorbed. A yield of 82% of pure I is obtained; some  $As_2O_3$  may be formed if oxidation is too rapid. Electrolytic oxidation of II in  $H_2SO_4$ , although yielding 70-80%, proved inconstant and slow. S. WALDBOTT

**Preparation of dialkylmercury compounds from the Grignard reagent.** II. The relative stability of the carbon-mercury linkage in dialkyl-mercury compounds. C. S. MARVEL and H. O. CALVERY. *J. Am. Chem. Soc.* **45**, 820-3(1923); cf. *C. A.* **16**,

1561.—The method described in the earlier paper has been extended to the prepn. of compds. contg. the linkages  $R_2CHHg-$  and  $R_2CH_2Hg-$ . Comparison of the reactions  $RHgR + HCl \rightarrow RHgCl + RH$  and  $RHgR (+ \text{heat}) \rightarrow RR + Hg$  carried out on the three Bu derivs. shows that the stability of the C-Hg linkage decreases in the order  $RCH_2Hg-$ ,  $R_2CHHg-$ ,  $R_2CH_2Hg-$ . Mercury di-*sec*-butyl, from MeEtCHMgBr and  $HgCl_2$ ,  $b_p$  93–6°,  $d_{20}^{20}$  1.763,  $n_D^{20}$  1.511 (yield, 66%), gives in alc. with aq. HCl *sec*-butylmercuric chloride, m. 30.5°, and with HBr the bromide, m. 39°. Mercury di-*sec*-octyl, decomp. on distn. even under 3 mm.,  $d_{20}^{20}$  1.338,  $n_D^{20}$  1.334 (yield, 52%); *sec*-octylmercuric bromide m. 98°. Mercury di-*tert*-butyl,  $b_p$  78–82° (considerable decompn.),  $d_{20}^{20}$  1.749,  $n_D^{20}$  1.521 (yield 9%); *tert*-butylmercuric bromide, m. 106° (decompn.), decomp. very rapidly in bright sunlight. Mercury di-*tert*-amyl,  $b_p$  80–4° (considerable decompn.),  $d_{20}^{20}$  1.649,  $n_D^{20}$  1.492 (yield, 21%); *tert*-amylmercuric bromide, m. 82°.  $n_D^{20}$  for  $HgMe_2$  is 1.532,  $HgEt_2$  1.543,  $HgPr_2$  1.517,  $Hg(CHMe)_2$  1.532,  $HgBu_2$  1.504.

C. A. R.

Selective activation of alumina. II. Reactions of formic acid at the surface of alumina. HOMER ADKINS AND B. H. NISSEN. *J. Am. Chem. Soc.* 45, 809–15(1923); cf. C. A. 16, 4118.—The effect of  $H_2O$  and temp. on the decompn. of  $HCO_2H$  passed over (1)  $Al_2O_3$  prepd. from Al-Hg and  $H_2O$ , (2)  $Al_2O_3$  from  $(Me_2CHO)_3Al$  on pumice, (3)  $Al_2O_3$  from  $(Me_2CHO)_3Al$  in pills, (4)  $Al_2O_3$  from  $(BuO)_3Al$  on pumice, (5) glass wool, and (6) pumice was studied. The amts. of  $H_2$  and  $CO_2$  formed agreed very closely, so that the decompn. occurs almost entirely according to the reactions  $HCO_2H = CO_2 + H_2$  (I) and  $HCO_2H = CO + H_2O$  (II) and to no considerable extent according to the equation  $2HCO_2H = HCHO + CO_2 + H_2O$ . Catalyst (1) is much less active in inducing reaction I and much more active for II than (3) and the same is true for (2) as compared with (4). The action of (2) is not comparable with that of (3) for (6) itself is slightly active but there is justification for saying that the effectiveness for I decreases in the order  $Al_2O_3$  from  $(Me_2CHO)_3Al$ ,  $(BuO)_3Al$  and Al-Hg. Increasing the concn. of aq.  $HCO_2H$  (with (1) and (2)) from 15% to over 90% causes an approx. linear increase in the ratio II : I, the amt. of the increase being very different for the 2 catalysts; with 98–100% acid, however, II occurs to a relatively much smaller extent than with more dil. acid. With (1) and (3), II has the higher temp. coeff. The results indicate that  $Al_2O_3$  may be selectively activated towards the 2 reactions by modifying the distance between the Al atoms. The effect of the amt. of  $H_2O$  in the gas phase and of the spacing of the atoms in the solid catalyst upon the ratio of the 2 reactions is interpreted in terms of an extension of Langmuir's theory of the mechanism of reactions at surfaces. The catalyst detcs. not only the relative extents but also the relative temp. coeffs. of the 2 reactions. The very considerable relative decrease in II when very concd.  $HCO_2H$  is used is entirely out of harmony with the hypothesis of selective adsorption as to the causation of reactions.

C. A. R.

Separation of propionic acid from pyroligneous acid. G. W. DOUGLAS. *J. Soc. Chem. Ind.* 42, 146T(1923).—Unsuccessful attempts to sep. PROH from pyroligneous acids are reported. Fractional distn. or pptn., extn. by kerosene after satn. with  $CaCl_2$ , etc. were studied but no satisfactory method was evolved.

C. J. WEST

Hydroxystearic acid and some of its derivatives. I. GUY RADCLIFFE AND W. GIBSON. *J. Soc. Dyers Colourists* 39, 4–10(1923); cf. C. A. 14, 3330.—The *dl*-hydroxystearic acid (I) formerly described as the  $\beta$ -variety was prepd. by a modification of the David method with a max. yield of 31.4%, m. 76.5–7.5°. Repeated recrystn. gave a m. p. of 85°; I value, nil; neutralization value, 186.9; mol. wt., 297.7–9.7. *Me ester* prepd. by the usual method with dry HCl gas and MeOH, m. 46°, sapon. value 178.6. *Et ester* (II), m. 48.5°. I with  $Ac_2O$  and fused NaOAc gave a powder, m. 31–2°. It was impossible to benzoylate I by the Schotten-Baumann reaction using  $BzCl$  and NaOH or  $Bz_2O$ . II treated with  $Bz_2O$  and NaOBz gave a pale yellow uncrystallizable oil.  $\alpha$ -Bromostearic acid (III), m. 58°, was prepd. by the Auwers and Bernhardt method from stearic acid, m. 69°. III treated with  $AgNO_3$  in alc. on a  $H_2O$  bath gave a N- and Br-free, tallow-like mass, m. 32–3°, which with  $Ac_2O$  and NaOAc, gave a compd. m. 38–40°. I in glacial AcOH with fuming  $HNO_3$  gave a greenish yellow cryst. compd. (IV), m. 83–3.5°, a yellow oil, and a solid, m. 100–20°. IV has about the compn.  $C_{18}H_{34}O_6$ , is N-free, mol. wt. 195–293. Its *Me ester*, m. 55°; *Et ester*, m. 52°. CHAS. E. MOLIN

The separation of methyl oleate and linoleate by fractional distillation. EMILIE ANDRÉ. *Compt. rend.* 176, 686–9(1923); cf. C. A. 15, 3404, 3562; 16, 3549.—The fluid acids from grape seeds, oleic (I) and linoleic, are sep'd. only imperfectly by fractional distn. of their *Me esters* under 1–3 mm., as judged by the I adsorption. *Me oleate* is more easily obtained relatively pure than *Me linoleate* on account of the latter's tendency

to polymerize. Laurent's method (*Ann. chim. phys.* 65, 102(1837)) of identifying I, based on its conversion to elaidic acid by reaction with  $\text{Hg}_2(\text{NO}_3)_2$ , is recommended.

A. R. ALBRIGHT

**The preparation of acetic anhydride by the action of sulfur chlorides on sodium acetate.** ABEL, CAULLE. *Bull. soc. ind. Rouen* 50, 385-7(1922).—The reaction of  $\text{S}_2\text{Cl}_2$  with  $\text{AcONa}$  always gave  $\text{Ac}_2\text{O}$ ,  $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$  and S. By increasing the Cl content of the  $\text{S}_2\text{Cl}_2$ , the amt. of free S in the residue decreased, and a given wt. of chloride could transform a greater amt. of  $\text{AcONa}$  into  $\text{Ac}_2\text{O}$ . C. infers that the reaction takes place in 2 stages: (1)  $8\text{AcONa} + 3\text{S}_2\text{Cl}_2 = 6\text{NaCl} + \text{Na}_2\text{SO}_4 + 5\text{S} + 4\text{Ac}_2\text{O}$ , and (2) the liberated S reacts with fresh Cl to give  $\text{S}_2\text{Cl}_2$ . The complete reaction can be represented by:  $8\text{AcONa} + \text{S} + 6\text{Cl} = 6\text{NaCl} + \text{Na}_2\text{SO}_4 + 4\text{Ac}_2\text{O}$ . Exact verification in the lab. cannot be obtained, as it is extremely difficult to obtain a complete reaction; but the fact that all free S disappears when proportions of S and of Cl corresponding to the equation are used strongly supports this view.

A. PAPINEAU-COUTURE

**The changes of acrolein and the antioxigenes.** III. CHARLES MOUREU and CHARLES DUFRAISSE. *Bull. soc. chim.* 31, 1152-76(1922); cf. C. A. 17, 1621, 1951.—Com. acrolein (A) is very unstable and may change very rapidly to a sol. resin or to an insol. resin, disacryl. This instability is accompanied by a peculiar free acidity which is not similar to that produced by acrylic acid or  $\text{AcOH}$ . When prepd. pure in the absence of O, A is neutral and stable. If a small amt. of O is added, A becomes unstable with absorption of O. Many phenols such as hydroquinone, pyrocatechol and pyrogallol (antioxigenes) entirely prevent this oxidation. They likewise prevent similar changes in other aldehydes:  $\text{BzH}$ ,  $\text{AcH}$ ,  $\text{PhCH:CHCHO}$  and furfural. Sunlight changes A to a visible appearance of disacryl in 3 mins. During prolonged reaction the mass solidifies. A trace of O in the absence of light produces the same change, while an excess of O prevents the formation of disacryl by sunlight. The theory of the mechanism of these transformations is discussed.

J. B. BROWN

**Neutral salt compounds of amino acids and polypeptides.** PAUL PFEBER. *Z. anorg. Chem.* 36, 137-8(1923).—In order to explain the nature of the adsorption compds. of salts and proteins, the reaction of these salts with the simpler  $\text{NH}_2$  acids and polypeptides has been studied. General results only are reported. Well crystd. compds. of  $\text{CaCl}_2$  with 1, 2 and 3 mols.  $\text{H}_2\text{NCH}_2\text{CO}_2\text{H}$ , of  $\text{CaBr}_2$  with 2 and 3 mols.,  $\text{CaI}_2$  with 2 and 4 mols. and  $\text{LiCl}$  with 1 and 2 mols. have been isolated. These may be isolated by concn. of aq. solns. of definite concn. or by pptn. with  $\text{EtOH}$ . Glycylglycine, diglycylglycine, alanylglycine and glycidiglycylglycine likewise give compds. with  $\text{LiCl}$ ,  $\text{LiBr}$ ,  $\text{LiI}$ ,  $\text{CaCl}_2$ ,  $\text{CaBr}_2$ , etc., most of the compds. being composed of 1 mol. of the components. Since in these cases the soly. of the  $\text{NH}_2$  acid is greatly increased, these compds. must also exist in soln. From the chem. nature of the proteins one must consider the adsorption products as chem. compds., comparable to the salt compds. of the  $\text{NH}_2$  acids and the polypeptides.

C. J. WEST

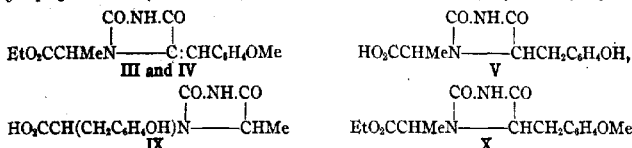
**A possible asymmetry of aliphatic diazo compounds.** IV. P. A. LEVENE and L. A. MIKESKA. *J. Biol. Chem.* 55, 795-800(1923); cf. C. A. 16, 4186.—The expts. of Chiles and Noyes (C. A. 16, 3466) in which it was claimed that the optically active di-Et diazoglutarate was reduced to the optically active glutamic acid were repeated with both the diazoglutarate and the diazosuccinate, but only inactive glutamic and aspartic acids were obtained. C. and N. state that the diazo ester and the di-Et malate derived from *l*-asparagine were *l*-rotatory, but L. and M. always found them to be *d*-rotatory. A large quantity of the active di-Et bromosuccinate was hydrolyzed with 10%  $\text{HCl}$  and 800 g. of the products of hydrolysis, consisting of a mixt. of bromosuccinic, chlorosuccinic and fumaric acids,  $[\alpha]_D^{20}$  0.2°, was obtained. By means of repeated fractional crystn. from a mixt. of  $\text{Et}_2\text{O}$  and petroleum ether, a substance was obtained,  $m. 176^\circ$ ,  $[\alpha]_D^{20}$  60.45°. It contained 35.96% Br and 2.35% Cl and was evidently a mixt. of *d*-bromosuccinic and *dl*-chlorosuccinic acids. The optical activity of the di-Et bromosuccinate and, consequently, that of the diazosuccinate from which it was derived, were due not to impurities but to the real existence of optically active di-Et diazosuccinate.

I. GREENWALD

**Some derivatives of cystine and cysteine.** GEO. J. SHIPLE and C. P. SHERWIN. *J. Biol. Chem.* 55, 671-80(1923).—*Diphenylacetylcystine*,  $m. 119-21^\circ$ , soly. in hot  $\text{H}_2\text{O}$ , 0.7%. *Phenylacetylbenzylcystine*, from benzylcystine,  $m. 87-9^\circ$ . *Phenyluraminobenzylcystine*,  $m. 145-6.5^\circ$ . When heated with 7-10%  $\text{HCl}$  in 33%  $\text{AcMe}$ , it yielded *benzylcysteinophenylhydantoin*,  $m. 118-9.5^\circ$ . *Acetylbenzylcystine*,  $m. 156-7^\circ$ . *Phenyluraminocystine*,  $m. 134-6^\circ$ . *p*-Chlorobenzylcystine,  $m. 219-20^\circ$ . In addn., the following previously described substances were prepd. by slight modification of well known

hydantoin (I) and the corresponding anisyl deriv. (II) with  $\text{MeCHBrCO}_2\text{Et}$  are alkylated on the 3-N atom. I gives 2 isomeric esters (III and IV), converted by HI and red P on heating at low temps. into the same compd. (V) and hydrolyzed by concd. boiling

HCl to the corresponding isomeric acids (VI and VII), both of which with HI and red P at low temps. likewise give V. V with HI and red P at 180° gives NH<sub>3</sub> and an acid (VIII), HO<sub>2</sub>CCHMeNHCH(CO<sub>2</sub>H)CH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>OH. With concd. HCl at 180° V rearranges quant. into an isomer (IX). In the alkylation of I only IV is at first obtained (after 3-4 hrs. heating) and in small amts.; 24 hrs. heating gives a mixt. of III, IV and unchanged I; after 6 days only III is found; no method for transforming III into IV has yet been found. Each ester is readily obtained from its corresponding acid with alc. HCl. Alkylation of II with MeCHBrCO<sub>2</sub>Et yields X, obtained in only 1 form, which is readily hydrolyzed to the free acid (XI) by acids or alkalis and is easily regenerated from XI with alc. HCl. XI is readily ruptured by alkalis to the salt NaO<sub>2</sub>CCHMeN(CONH<sub>2</sub>)CH(CO<sub>2</sub>Na)CHCH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>OMe, which with aq. acids gives the free acid (XII); this, however, readily condenses to XI and can be isolated only by decomg. its Na salt with HCl in an anhyd. solvent. XI is also obtained from IV with Na-Hg in alc. With HI X and its derivs. pass readily into V. *Et 4-anisalyhdantoin-3-α-propionates*: III, m. 143°, soly. in hot alc. about 4 g. in 100 cc.; IV, m. 176°, soly. in



boiling alc. about 3 g. in 100 cc., in CHCl<sub>3</sub> about 6.5 g. in 100 cc. Free acids: VI, m. 245°, soly. in hot AcOH 3.4 g. in 40 cc.; VII, m. 269°, soly. in hot AcOH 1.7 g. in 60 cc.; the Na salt of VII forms a yellow hydrate. *Et 4-anisalyhdantoin-3-α-propionate* (X), m. 138°; free acid (XI), m. 184-5°. *α-Methyl-α-[p-methoxybenzyl]diglycolamidic acid urea* (XII), m. 148-9° (gas evolution), soly. in hot H<sub>2</sub>O 1.5 g. in 15 cc.; *di-Na salt*, m. about 240°. *4-Hydroxybenzylhydanoin-3-α-propionic acid* (V), m. 217°; *Et ester*, m. 192°. *4-Methylhydanoin-3-hydroxybenzyl-3-propionic acid* (*4-methylhydanoin-3-[p-hydroxyphenyl-α-propionic acid]*) (IX), m. 221°, depresses the m. p. of V to 206-11°. *Anhydride of VIII*, m. 184°. The fact that alkylation of the polypeptide hydantoin may take place on both the 3- and 1-N atoms emphasizes further the analogy of these compds. to the dihydroxypropyrimidines.

The existence of the geometrical isomers III and IV indicates the possibility of a certain rigidity in the configuration of the hydantoin mol.; hitherto it has been assumed that the mobility of the atoms in tautomeric substances operates against the fixed arrangement of parts which is generally presupposed in order to account for the phenomena of optical and geometrical isomerism. C. A. R.

**Synthesis of γ-amino-β-hydroxybutyric acid.** M. TOMITA. *Z. physiol. Chem.* 124, 253-5 (1923).—C<sub>6</sub>H<sub>5</sub>(CO)<sub>2</sub>NCH<sub>2</sub>CH(OH)CH<sub>2</sub>Cl (64 g.) in alc. refluxed 2 hrs. with 30 g. KCN in H<sub>2</sub>O gave 30 g. 1-cyano-2-hydroxypropyl-3-phthalimide m. 132°; 40 g. hydrolyzed by heating 100° with 40 cc. of concd. H<sub>2</sub>SO<sub>4</sub> for 10 min. and refluxing 3 hrs. after adding 80 cc. H<sub>2</sub>O gave 12 g. γ-amino-β-hydroxybutyric acid (I) neutral to litmus, tasteless, m. 214°, and gives the biuret test. A Cu salt is obtainable by treating the aq. soln. of I with freshly pptd. Cu(OH)<sub>2</sub>, warming, filtering excess of the Cu(OH)<sub>2</sub> and evapg. to crystn. Heated at its m. p. I foams and then solidifies, giving hydroxypropyrolidone, NH<sub>2</sub>CH<sub>2</sub>CH(OH)CH<sub>2</sub>CO (II), m. 118°. II may be methylated

by treating it in slightly less than 3 mols. concd. KOH with 3 mols. alc. MeI and then adding MeOH until soln. is complete. After long standing the soln. is neutralized and evapd. to dryness *in vacuo*. The residue is treated in H<sub>2</sub>O with excess of Ag<sub>2</sub>SO<sub>4</sub> and the filtrate again evapd. *in vacuo*. The residue is extd. with 80% alc. and the ext. concd. After acidification and filtration dil. AuCl<sub>3</sub> ppts. the yellow Au salt, m. 180-2°. The Au salt of carnitine m. about 30° lower. The relation to carnitine is being investigated. R. L. STEELE

**Fluoroacetyl derivatives of sugars.** I. D. H. BRAUNS. *J. Am. Chem. Soc.* 45, 833-5 (1923).—Cryst. fluoroacetyl derivs. of sugars have been obtained in small yields (2-4 g.) by treating the corresponding Ac derivs. (10 g.) 0.5 hr. with cold anhyd. HF, pouring into ice H<sub>2</sub>O and extg. with CHCl<sub>3</sub>. *Fluoroacetylglucose*, from β-pentaacetylglucose, m. 108°, is stable for months, has a very slightly bitter taste, [α]<sub>D</sub><sup>20</sup> 90.08° (CHCl<sub>3</sub>). *Fluoroheptaacetylcellulose*, m. 187°, [α]<sub>D</sub><sup>20</sup> 30.03°. *Fluorotriacetylxylose*, m. 87°, [α]<sub>D</sub><sup>20</sup> 67.24°. C. A. R.



Reactions of strongly electropositive metals with organic substances in liquid ammonia solution. I. Preliminary investigations. C. A. KRAUS AND GEO. F. WHITE. *J. Am. Chem. Soc.* **45**, 768-78(1923).—It is the purpose of this series of articles to present the results obtained in a systematic investigation of reduction reactions in liquid  $\text{NH}_3$ —reactions which are extremely varied. The results of preliminary expts. on the action of Na in liquid  $\text{NH}_3$  with hydrocarbons, alcs., phenols, thiophenols, ethers, aldehydes,  $\text{Me}_2\text{CO}$ ,  $\text{Ph}_2\text{CO}$ ,  $\text{NaOAc}$ ,  $\text{NaOBz}$ ,  $\text{PrI}$ , *tert*- $\text{AmI}$ ,  $(\text{CH}_2\text{Cl})_2$ ,  $(\text{CHBr})_2$ ,  $\text{PhCH}_2\text{Cl}$ ,  $\text{Ph}$  halides, *o*- and *p*- $\text{ClC}_6\text{H}_4\text{Me}$ , *o*- $\text{C}_6\text{H}_4\text{Me}_2$ ,  $\alpha$ - $\text{C}_{10}\text{H}_7\text{Br}$ ,  $\text{PhNO}_2$ ,  $\text{PhNCS}$ ,  $\text{PhCN}$ ,  $\text{PhSO}_3\text{Na}$ ,  $\text{Ph}_2\text{S}$  and metallo-org. compds. and of Mg in liquid  $\text{NH}_3$  on  $\text{PhI}$  and  $\text{EtI}$  are given briefly. Org. compds. contg. strongly electronegative groups are in general reduced, the groups or various elements of the groups forming salts with the metal, while the org. radical thus set free undergoes various reactions, depending on its nature and on that of the various other substances present. In most cases the  $\text{NH}_3$  takes part in the reaction. II. Action of sodium on phenyl halides in liquid ammonia. GEO. F. WHITE. *Ibid.* 779-84.—Na reacts with  $\text{Ph}$  halides in liquid  $\text{NH}_3$  in the mol. ratio 1:1 to form  $\text{C}_6\text{H}_5$ ,  $\text{PhNH}_2$ ,  $\text{Ph}_2\text{N}$  and  $\text{NaCl}$  with occasional traces of  $\text{PhNH}_2$ ,  $\text{PhNC}$  and  $\text{NaCN}$ . The  $\text{C}_6\text{H}_5$  is a primary product of the reaction,  $\text{PhNa}$  not being formed under the conditions.  $\text{Ph}_2\text{NH}$  and  $\text{Ph}_3\text{N}$  are partially miscible in the solid state, the limits of miscibility being approx. 13% and 75%  $\text{Ph}_2\text{N}$ ; a liquid phase with about 21%  $\text{Ph}_3\text{N}$  in equil. with the eutectic mixt. of the 2 solid solns. at  $43.6^\circ$ . The formation of  $\text{Ph}_3\text{N}$  is favored by diln. of the reaction mixt. with petr. ether and a new method for its prepn. is suggested.  $\text{Ph}_2\text{NNA}$  and  $\text{PhNHNa}$  are formed by the action of Na on  $\text{Ph}_2\text{NH}$  and  $\text{PhNH}_2$  in liquid  $\text{NH}_3$ . C. A. R.

Separation of xylenes. H. T. CLARKE AND E. R. TAYLOR. *J. Am. Chem. Soc.* **45**, 830-3(1923).—Fractional distn., selective sulfonation, crystn. of the  $\text{SO}_3\text{H}$  derivs. and selective hydrolysis of the  $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{H}$  all tend to effect a partial sepn. of the 3 xylenes present in coal-tar xylene but none of these processes alone is entirely suitable for the isolation of the *o*- and *p*-derivs. A satisfactory procedure in which the above processes are combined is described. C. A. R.

A new type of synthesis. I. The reaction between halogen-alkyl sulfonates and organomagnesium halides (preliminary note). HENRY GILMAN AND N. J. BRABER. *J. Am. Chem. Soc.* **45**, 839-42(1923).—Organo-Mg halides react smoothly in boiling  $\text{Et}_2\text{O}$  with halogen-alkyl esters of aromatic sulfonic acids, giving reasonably good yields of compds. contg. the halogenalkyl group in place of the original  $\text{MgX}$  group:  $\text{MeC}_6\text{H}_4\text{SO}_3\text{CH}_2\text{CH}_2\text{Cl} + \text{RMgX} = \text{RCH}_2\text{CH}_2\text{Cl} + \text{MeC}_6\text{H}_4\text{SO}_3\text{MgX}$ . The following % yields were obtained with *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{CH}_2\text{CH}_2\text{Cl}$ :  $\text{PhCH}_2\text{CH}_2\text{Cl}$  from  $\text{PhBr}$ , 36;  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{Cl}$  from  $\text{PhCH}_2\text{Cl}$ , 59;  $\text{CH}_2\text{CCl}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$  from  $\text{CH}_2\text{ClCH}_2\text{Cl}$ , 75;  $\text{BzOCH}_2\text{CH}_2\text{Cl}$  from  $\text{BzOMgBr}$ , 5.  $\gamma$ -Chloropropyl *p*-toluenesulfonate,  $b_7$ , 216-9°,  $n_{20}$  1.5230,  $d_4^{20}$  1.2674, with  $\text{PhBr}$  gave 31%  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{Cl}$ . C. A. R.

The decomposition of arylformamides. A new method of preparing substituted ureas. A. MAILHE. *Compt. rend.* **176**, 689-91(1923).—Arylated formamides are easily prep'd. by heating amines for a short time with  $\text{HCO}_2\text{H}$ . In attempting to prep.  $\text{PhCN}$  from  $\text{PhNHCOH}$  by leading its vapor (at  $284^\circ$ ) over  $\text{Al}_2\text{O}_3$  heated to  $400^\circ$ , the reaction  $\text{PhNHCOH} \rightarrow \text{H}_2\text{O} + \text{PhNC}$  over  $\text{Al}_2\text{O}_3$  is not the principal one; instead,  $\text{PhNH}_2$  and  $\text{CO}$  are the main products, but a very small amt. of  $\text{PhCN}$  is formed. The formation of  $\text{PhNH}_2$  is considered to be due mainly to direct loss of  $\text{CO}$ , but partially to the reaction  $\text{PhNC} + \text{H}_2\text{O} \rightarrow \text{PhNH}_2 + \text{CO}$ , and to  $\text{PhNHCOH} + \text{H}_2\text{O} \rightarrow \text{PhNH}_2 + \text{HCO}_2\text{H} \rightarrow \text{H}_2 + \text{CO}_2$ . When  $\text{PhNHCOH}$  vapor is passed over divided Ni at  $400$ - $410^\circ$ , the gaseous product contains  $\text{CO}_2$  26%,  $\text{CO}$  48%,  $\text{H}_2$  26%;  $\text{PhNH}_2$  is formed, along with  $(\text{PhNH})_2\text{CO}$ , the proportion of which increases with the rate of passing the vapor over the catalyst. The reaction is  $\text{PhNH}_2 + \text{HCONHPh} \rightarrow \text{CO}(\text{NHPh})_2 + \text{H}_2$ . The formamides of the 3 toluidines react in complete analogy with the  $\text{PhNH}_2$  deriv. A. R. ALBRIGHT

New method of preparing tetrasubstituted ureas. A. MAILHE. *Compt. rend.* **176**, 903-5(1923); cf. preceding abstr. *N*-*o*-Xyllylformamide, m.  $97^\circ$ , gave *sym-di-o*-xyllylurea, m.  $236^\circ$ . *N*-[Methylethylphenyl]formamide, m.  $151^\circ$ , gave *di*[methylethylphenyl]urea, m.  $215^\circ$ .  $\text{PhNHMe}$  warmed for 20 min. with  $\text{HCO}_2\text{H}$  gave *N*-methyl *N*-phenylformamide, yellow viscous liquid, b.  $286^\circ$ , whose vapors passed over Ni at  $380$ - $400^\circ$  yield among other products  $\text{CO}(\text{NMePh})_2$ , b.  $192^\circ$ . *N*-Ethyl-*o*-toluidine, b.  $207^\circ$ , with  $\text{HCO}_2\text{H}$  gives *N*-ethyl-*N*-*o*-tolylformamide, b.  $272^\circ$ , which was decomp'd. over Ni at  $410^\circ$ , yielding *diethyldi-o*-tolylurea, b.  $258$ - $60^\circ$ . *N*-*m*-Methylethylphenyl-*N*-ethylformamide, m.  $141^\circ$ , over Ni at  $400^\circ$ , gave a tetrasubstituted urea [ $\text{Et}(2,4\text{-MeEtC}_6\text{H}_3\text{N})_2\text{CO}$ , yellow, b.  $295^\circ$  without decompn. The work shows that tetra-

substituted alkylaryl ureas can be prep'd. by the catalytic decompn. of sec. arylalkylamines.

H. E. WILLIAMS

**Reactions of diazonium salts with cupric compounds.** A. CONTARDI. *Ann. chim. applicata* 7, 13–28 (1923).—A very detailed review of past work and certain conclusions from forthcoming work on the general reactions of diazonium salts, particularly in the presence of Cu<sup>+</sup> and Cu<sup>2+</sup> salts. Based on work to be published by C. with Francioli, Mor, Zucca, Albrici and Josti, the substitution of NH<sub>2</sub> by Cl and by Br in aromatic amines can be effected by the use of the corresponding Cu<sup>+</sup> halide, with yields always as high as, and in some cases higher than, those of Sandmeyer and others using Cu<sup>2+</sup> salts. As low as 0.05 to 0.01 equiv. of Cu<sup>+</sup> per equiv. of diazonium compd. can be used without diminishing the yields, for these depend chiefly on the temp. and on the rate at which the double salt decomps. F derives. cannot be prep'd. by this method. Full exptl. details of the prepn. of aromatic halides with Cu<sup>+</sup> are to be published and also work by C. and Cazzani on the substitution of the diazonium group by—AsO(OH)<sub>2</sub> by means of Cu<sup>+</sup>. The latter reactions have been found to be essentially the same as those for the introduction of NO<sub>2</sub> groups. An exhaustive survey of past and the new work indicates that (1) for mono-halogenated and mono-nitro PhNH<sub>2</sub> derivs., the substitution of NH<sub>2</sub> by NO<sub>2</sub> gives nearly theoretical yields except for *m*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, (2) the NH<sub>2</sub> group in a mono-halogenated O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> or (O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> can be replaced by NO<sub>2</sub> by preliminary diazotization only when the new NO<sub>2</sub> is so orientated that it can in turn be replaced by NH<sub>2</sub> by heating with alc. NH<sub>3</sub>, (3) halogen atoms introduced into the C<sub>6</sub>H<sub>5</sub> nucleus have usually but slight influence on the substitution reactions of NH<sub>2</sub> though in certain cases substitution is rendered impossible (2,4,6 to NH<sub>2</sub>), (4) NO<sub>2</sub> cannot be introduced in amines already contg. 3 NO<sub>2</sub> groups, and (5) some aromatic amines, particularly those contg. no strongly electro-negative group in either nucleus or substituent groups, are transformed, during the substitution of NH<sub>2</sub> by NO<sub>2</sub>, into the corresponding mononitrophenols. The discussion is amplified by many individual compds. and reactions.

C. C. DAVIS

**The liquid crystals of anisal-*p*-aminoazotoluene.** P. GAUBERT. *Compt. rend.* 176, 907–9 (1923).—Measurements of the index of refraction of birefractive liquids formed by mixts. of substances giving liquid crystals having the same optical sign show that the optical properties of the mixt. are intermediate between those of the pure crystals. (Cholesteryl propionate in Am cyanobenzalaminocinnamate.) It is not the case for the index of crystals obtained by admixt. of substances giving crystals of different optical sign. If the positive crystals are more refractive than the negative, the refraction, birefracton and rotatory power rise; if they have equal refraction the properties of the negative crystals change very slightly. Anisal-*p*-aminoazotoluene when melted on a glass plate and cooled rapidly gives a birefractive liquid, which remains so for a considerable time, but if warmed it becomes isotropic at 45°. It melts and gives liquid crystals if cooled again. If heated again it solidifies, giving 2 solid forms, one of which m. 115°. The isotropic liquid is very refractive, about 1.72.

H. E. W.

**Preparation of mercury dibenzyl.** A. GARCÍA BANÚS. *Anales soc. españ. fis. quim.* 20, 667–8 (1922).—Hg(CH<sub>2</sub>Ph)<sub>2</sub> is prep'd. by treating PhCH<sub>2</sub>Cl with excess of Mg dust and adding HgCl<sub>2</sub> in less than the theoretical amt., after decanting from the excess of Mg. The mixt. is heated with shaking for 5 hrs. under a reflux app. Dil. AcOH is added and Hg(CH<sub>2</sub>Ph)<sub>2</sub> is obtained by crystn. from Et<sub>2</sub>O. It m. 110–1° and is stable in sunlight. The mother liquor contains traces of PhCH<sub>2</sub>HgCl, which darkens rapidly on exposure to light and is also formed if the HgCl<sub>2</sub> is used in excess.

L. E. GILSON

**Arsonation of *o*- and *m*-cresol.** W. G. CHRISTIANSEN. *J. Am. Chem. Soc.* 45, 800–4 (1922).—Treatment of *o*- and *m*-cresol with H<sub>3</sub>AsO<sub>4</sub> gives a series of compds. homologous with those obtained with PhOH (Jacobs and Heidelberg, *C. A.* 13, 2371); in the case of the *o*-cresol considerable tar is formed, which renders the isolation of the products difficult, and the yields are lower than with PhOH. *o*-Cresol (224 g.) gives: (1) 3,4-Me(HO)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub>, softens 146°, m. 170° (isolated as the *mono*-Na salt (41 g.), crystals with 2.5 H<sub>2</sub>O), gives no red color with FeCl<sub>3</sub> in H<sub>2</sub>O; (2) 1.3 g. of the *2-HO isomer*, m. 198–200°, gives a very deep purple color with FeCl<sub>3</sub> (*Ba salt*, 11.8 g.); (3) 1.6 g. (3,4-Me(HO)C<sub>6</sub>H<sub>3</sub>)<sub>2</sub>AsO<sub>2</sub>H, m. 249°, gives color with FeCl<sub>3</sub>; and (4) 0.03 g. 3,3-dimethyl-2,4-dihydroxydiphenylarsinic acid, m. 208–10°, gives with FeCl<sub>3</sub> a light purple color becoming deep red on warming. Similarly, 300 g. *m*-cresol gives: (1) 2,4-Me(HO)C<sub>6</sub>H<sub>3</sub>AsO<sub>2</sub>H<sub>2</sub>, needles with 1 H<sub>2</sub>O, m. 194–5°, (*mono*-Na salt, seps. with 5 H<sub>2</sub>O; yield of anhyd. salt, 138.8 g.), gives a heavy white ppt. with Br water and no color with FeCl<sub>3</sub>; (2) 2.5 g. 1-methyl-3-hydroxyphenyl-2-(or 4)-arsonic acid (2 H<sub>2</sub>O), m. anhyd. 165–7°, gives a very deep red color with FeCl<sub>3</sub>; and (3) 2.5 and 0.7 g. of mixts.

of arsenic acids giving a deep purple color with  $\text{FeCl}_3$  and partially sepd. by means of the Ca salts.

C. A. R.

**Methylation and sulfonation of phenols with dimethyl sulfate in the absence of water.** L. J. SIMON AND M. FRÉJACQUES. *Compt. rend.* 176, 900-2(1923).—The methylating action of  $\text{Me}_2\text{SO}_4$  on phenols has already been utilized. The equation for the action in alk. soln. is  $\text{ROH} + \text{Me}_2\text{SO}_4 + \text{KOH} = \text{ROME} + \text{SO}_2\text{KMe}$  and the yield is excellent. S. and F. studied the action in the absence of alkali and found that when equimol. amts. of  $\text{PhOH}$  and  $\text{Me}_2\text{SO}_4$  are heated at  $100-20^\circ$   $\text{Me}_2\text{O}$  is evolved during 2 hrs. and the reaction is not then completed.  $\text{PhOMe}$  is also formed.  $\text{PhOH} + \text{Me}_2\text{SO}_4 = \text{PhOMe} + \text{SO}_2\text{HMe}$ .  $\text{Me}_2\text{O}$  is formed according to the equations  $\text{PhOMe} + \text{SO}_2\text{Me}_2 = \text{MeOC}_6\text{H}_4\text{SO}_2\text{H} + \text{Me}_2\text{O}$ , and  $\text{PhOH} + \text{SO}_2\text{Me}_2 = \text{HOC}_6\text{H}_4\text{SO}_2\text{H} + \text{Me}_2\text{O}$ . Furthermore the  $\text{SO}_2\text{H}$  acids are then methylated.  $\text{MeOC}_6\text{H}_4\text{SO}_2\text{H} + \text{Me}_2\text{SO}_4 = \text{MeOC}_6\text{H}_4\text{SO}_2\text{Me} + \text{MeHSO}_4$ , and  $\text{HOC}_6\text{H}_4\text{SO}_2\text{H} + \text{Me}_2\text{SO}_4 = \text{HOC}_6\text{H}_4\text{SO}_2\text{Me} + \text{MeHSO}_4$ .  $\text{PhOMe}$  was subjected to the action of  $\text{Me}_2\text{SO}_4$  as was  $\text{PhOH}$  but in the absence of  $\text{H}_2\text{O}$  and alkali. The same products were formed as when  $\text{PhOH}$  was used and the major components of the reaction mixt. were  $\text{SO}_2\text{H}$  acids,  $\text{MeOC}_6\text{H}_4\text{SO}_2\text{H}$  predominating. *Me phenolsulfonate* m.  $95^\circ$ , *Me o-cresolsulfonate* m.  $93^\circ$ , *Me p-cresolsulfonate* m.  $70^\circ$ ; the corresponding *di-esters*, m.  $30^\circ$ ,  $58^\circ$  and  $70^\circ$ , were prepd. (Ferns and Lapworth, C. A. 6, 1742.) These esters are sol. in  $\text{H}_2\text{O}$ , well cryst. and decomp. when distd. in the vacuum of a  $\text{H}_2\text{O}$  pump but are stable when distd. under lower pressures, and b.  $150-60^\circ$ . When treated with primary amines at  $80^\circ$  a reaction according to the equation  $\text{R}(\text{OH})\text{SO}_2\text{Me} + 2 \text{PhNH}_2 \rightarrow \text{R}(\text{OH})\text{SO}_2\text{H} \cdot \text{PhNH}_2 + \text{PhNHMe}$  is effected. With  $\text{PhOH}$  in the presence of alkali the reaction progresses according to the equation  $\text{R}(\text{OMe})\text{SO}_2\text{Me} + \text{PhOH} = \text{R}(\text{OMe})\text{SO}_2\text{H} + \text{PhOMe}$ .

H. E. WILLIAMS

**Preparation of  $\alpha$ -homoheliotropin from safrole by ozone and synthesis of its derived perfumes.** I. SNOICHIRO NAGAI. *J. Chem. Ind. (Japan)* 25, 1409-21(1922); cf. C. A. 16, 4182.—Safrole has a side-chain allyl group which can be ozonized to isosafrole and aldehyde. N. studied various methods of decompn. of this safrole ozonide to  $\alpha$ -homoheliotropin or  $\alpha$ -homopiperonal. Safrole is dissolved in an abs. dry solvent (10-15 parts), and 2-3% ozonized air is passed at the rate of 35-71 per hr. at room temp. The ozonide is much less sol. in these solvents than isosafrole ozonide. It often resinizes in org. solvents, except in glacial  $\text{AcOH}$ . Various methods of decompn. of this ozonide were tried. Neither (1) vacuum distn. at room temp., (2) heating in glacial  $\text{AcOH}$  at  $70-80^\circ$  for 1.5 hrs., dilg. with  $\text{H}_2\text{O}$  and extg. with  $\text{Et}_2\text{O}$ , (3) extg. with  $\text{Et}_2\text{O}$  after 1 hr.'s stirring of the glacial  $\text{AcOH}$  soln. dild. with  $\text{H}_2\text{O}$ , nor (4) decomp. with concd.  $\text{HCl}$  of the dried decompd. substance obtained by adding cold satd. aq.  $\text{NaHSO}_3$  to the  $\text{CHCl}_3$  soln. is satisfactory, because the resulting products are resinous and the yield of  $\alpha$ -homoheliotropine is poor. If  $\text{H}_2\text{O}$  and  $\text{Zn}$  powder are added to the glacial  $\text{AcOH}$  soln., and it is extd. with  $\text{Et}_2\text{O}$ , 60-65% of the aldehyde b.  $131-3^\circ$ ,  $d_4^{20}$  1.2654,  $n_D^{20}$  1.5547 is obtained; oxime (82.5% yield), m.  $119^\circ$ , semicarbazone (90% yield), m.  $176-7^\circ$ ; phenylhydrazone (70% yield), m.  $176^\circ$ . It gives a yellowish brown color with concd.  $\text{HNO}_3$ , easily gives a  $\text{NaHSO}_3$  compd. (85-95% yield), which goes back to the original aldehyde on treating with dil. acid or alkali.  $\alpha$ -Homoheliotropin is polymerized easily to resinous matter by heat or various chem. reagents. It is a fragrant oil, similar to heliotropin and is a good source for various perfumes. Also in English in *J. Faculty Eng. Tokyo Imp. Univ.* 13, 185-92(1923).

S. T.

**The pinenes.** M. PARISELLE. *Ann. chim.* 19, 119-35(1923).—By careful fractionation of French turpentine, there were obtained  $\alpha$ -pinene,  $d_4^{20}$  0.8747,  $n_D^{20}$  1.469,  $b_{760}$   $154^\circ$ ,  $b_{722}$   $64^\circ$ ,  $b_{711}$   $42^\circ$ , and  $\beta$ -pinene,  $d_4^{20}$  0.8848,  $d_{15}^{20}$  0.8728,  $n_D^{20}$  1.479,  $b_{760}$   $163-4^\circ$ ,  $b_{711}$   $71.5^\circ$ ,  $b_{711}$   $50^\circ$ . Upon distn. under 12 mm. of the liquid obtained by the action of  $\text{Br}$  upon  $\alpha$ -pinene, *isobornyl bromide* came over at  $94^\circ$ ; at  $100-160^\circ$  a liquid monobromide,  $b_{711}$   $102^\circ$  and contg. 37.85%  $\text{Br}$ , was obtained together with a cryst. dibromide, contg. 54.55%  $\text{Br}$ , decomp. at  $130-50^\circ$ . The residue in the flask consisted of a dibromide, m.  $168^\circ$  and contg. 54.49%  $\text{Br}$ . A study of the addn. compds. of pinene with  $\text{HCl}$  showed the existence of an optically inactive form of  $\alpha$ -pinene. T. S. C.

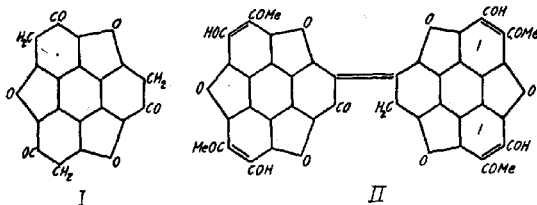
**Some dihydroxyphenones and derivatives.** B. H. GNAGY. *J. Am. Chem. Soc.* 45, 805-8(1923).—2,4-( $\text{HO}$ ) $_2\text{C}_6\text{H}_3\text{COEt}$ , m.  $98^\circ$ , gives a red color with  $\text{FeCl}_3$ , was prepd. by boiling  $\text{EtCO}_2\text{H}$  with  $\text{ZnCl}_2$  and then with  $m\text{-C}_6\text{H}_4(\text{OH})_2$ ;  $\text{Br}$  in  $\text{AcOH}$  converts it into the 3,5- $\text{Br}_2$  deriv., m.  $148^\circ$ , whose greenish yellow *phenylhydrazone* m.  $173^\circ$  (decompn.). 2,4-Dihydroxybutyrophenone, m.  $63-5^\circ$  (Johnson and Lane, C. A. 15, 1527, give  $69-70^\circ$ ); *phenylhydrazone* (?), brown, m.  $191-3^\circ$  (decompn.); 3,5- $\text{Br}_2$  deriv., m.  $113^\circ$  (*phenylhydrazone*, yellow, m.  $155^\circ$ ).

C. A. R.

**The equilibrium between benzaldehyde and benzoin.** ERNEST ANDERSON and R. A. JACOBSON. *J. Am. Chem. Soc.* **45**, 836-9 (1923).—The  $\text{BzH} \rightarrow \text{PhCH(OH)Bz}$  condensation is reversible. The equil. const. at  $79^\circ$  in 95% alc. in the presence of about 2.5% NaCN is about 0.245. Equil. is reached in about 1 hr., starting from BzH, and 1.5 hrs., starting from benzoin. Along with the above condensation there is another reaction proceeding very slowly. C. A. R.

**The dinitronaphthalenes.** IV. V. VESELY and K. DVORAK. *Bull. soc. chim.* **33**, 319-33 (1923).—The diazo compd. of  $1,6\text{-C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$ , prepd. by adding  $\text{NaNO}_2$  soln. to the amine in AcOH and  $\text{H}_2\text{SO}_4$ , was treated with Cu bronze and  $\text{NaNO}_2$ . The products were filtered and extd. with alc., when the yellow *1,6-dinitronaphthalene*, m.  $161\text{--}2^\circ$ , sepd. in 21.6% yield. In a similar manner *1,7-dinitronaphthalene*, yellow, m.  $156^\circ$ , was prepd. in a 22% yield. The same procedure gave a very poor yield of *1,4-dinitronaphthalene*, yellow, m.  $129^\circ$ . *2-Diazonaphthalene 1-oxide*, m.  $73\text{--}6^\circ$ , exploding  $112^\circ$ , was obtained by adding Cu powder and  $\text{NaNO}_2$  soln. to the diazo deriv. of  $1,2\text{-C}_{10}\text{H}_6(\text{NO}_2)\text{NH}_2$  and crystg. from  $\text{Et}_2\text{O}$ . *1,2-Dinitronaphthalene*, m.  $102\text{--}3^\circ$ , and the *1,3-compd.*, m.  $144\text{--}5^\circ$ , were prepd. from the corresponding dinitrotetrahydronaphthalenes by brominating and boiling to split off HBr. Reduction of the corresponding di- $\text{NO}_2$  compds. with  $(\text{NH}_4)_2\text{S}$  gave *5-nitro-2-naphthylamine*, m.  $143^\circ$ ; *8,2-isomer*, m.  $104\text{--}5^\circ$ ; and *3,1-compd.*, m.  $136\text{--}7^\circ$ , Ac deriv., m.  $255^\circ$ . Decompn. of the *1-diazo-3-nitronaphthalene* by  $\text{H}_2\text{O}$  gave *3-nitro-1-naphthol*, m.  $167\text{--}8^\circ$ . Reduction of the corresponding  $\text{NO}_2$  compds. with  $\text{SnCl}_2$  gave *6-nitro-1-naphthylamine*, m.  $143^\circ$ , (Ac deriv., m.  $232\text{--}3^\circ$ ); *7,1-isomer*, m.  $121\text{--}2^\circ$ , (Ac deriv., m.  $206\text{--}7^\circ$ ); and *1,2-compd.*, m.  $126\text{--}7^\circ$ . The action of  $\text{PhNH}_2$  and alc. on  $1,2\text{-C}_{10}\text{H}_6(\text{NO}_2)_2$  gave *2-nitro-1-phenylaminonaphthalene*. T. S. CARSWELL.

**Lignin.** WALTHER SCHRAUTH. *Z. angew. Chem.* **36**, 149-52 (1922).—S. correlates his recent work (C. A. **17**, 280) with that of Willstätter and Kalb on the reduction of lignin (C. A. **17**, 982) and believes that the reduction products of lignin contain a hydro-



genated 9,10-benzophenanthrene, bicyclohexane and a perhydrodimethylphenanthrene. The condensation of 3 mols. glucose may conceivably give rise to a compd. of constitution I, which S. believes to be a possible building unit for lignin. From the consideration of various reactions and derivs. of lignin, S. suggests II as a formula for it.

C. J. WEBB

**Fluorescence and chemical constitution of benzoxazole derivatives.** II. F. HEINRICH, H. SUMTHEIMER and C. STEINMANN. *Ber.* **55B**, 3911-21 (1922).—Crescorcinol, m.  $105\text{--}7^\circ$ , was prepd. from  $2,4\text{-(H}_2\text{N)}_2\text{C}_6\text{H}_3\text{Me}$  by the diazo reaction. In  $\text{Et}_2\text{O}$  it gave with fuming  $\text{HNO}_3$ ,  $3,2,4\text{-O}_3\text{N(HO)}_2\text{C}_6\text{H}_2\text{Me}$ , red, m.  $111^\circ$ , volatile in steam, and the 5- $\text{NO}_2$  isomer, orange-yellow, m.  $118\text{--}9^\circ$ . These were sepd. by steam distn. and converted into  $3,2,4\text{-H}_3\text{N(HO)}_2\text{C}_6\text{H}_2\text{Me}$  (I) and the 5- $\text{NH}_2$  isomer (II) with  $\text{SnCl}_2$  in HCl. The HCl salt of I gave on heating with  $\text{BzCl}$  and sapon. with alc. KOH  $2(\mu)\text{-phenyl-4-hydroxy-5-toluxazole}$  (III) which shows no fluorescence in alk. soln. Similarly from II was obtained  $2(\mu)\text{-phenyl-6-benzoxo-5-toluxazole}$ , m.  $164\text{--}5^\circ$ , which on sapon. gave the 6-HO compd. (IV), which dissolves in NaOH with a green fluorescence. II was obtained in better yield by the reduction of the nitrosocrescorcinol,  $5,2,4\text{-ON(HO)}_2\text{C}_6\text{H}_2\text{Me}$ , obtained from alc. crescorcinol, and  $\text{AmNO}_2$ .  $\text{Ac}_2\text{O}$  and the HCl salt of II yielded  $2(\mu)\text{-methyl-6-acetoxy-5-toluxazole}$ , m.  $94^\circ$ , which on sapon. gave the 6-HO compd. (V), m.  $221^\circ$ . In previous work it was shown that fluorescence in alk. soln. of compds. of the type  $\text{HOC}_6\text{H}_3\text{N:CR.O}$  is produced when R is an aromatic radical and the OH is in the *p*-position to the N. The same rule applies in the present case since IV shows fluorescence while III and V do not. In the two amino orcinols, 4,3,5- (VI) and 2,3,5- $\text{H}_2\text{N(HO)}_2\text{C}_6\text{H}_2\text{Me}$

(VII), only VII gives litmus-like colors by the autoxidation of its alk. soln., but the autoxidation of 2,4-(HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub> does not produce similar colors. G. W. S.

**β-Arylaminoethanols.** ROGER ADAMS and J. B. SEIGUR. *J. Am. Chem. Soc.* **45**, 785-90 (1923).—From ClCO<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Cl and 2 mols. primary aromatic amines in C<sub>6</sub>H<sub>6</sub> were obtained nearly quant. the following β-chloroethyl arylcarbamates, RNHCO<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Cl: *o*-tolyl, m. 45°, b<sub>716</sub> 209-10°; *p*-tolyl, m. 61°; *o*-chlorophenyl, m. 56.5-57°; *p*-chlorophenyl, m. 62-3°; *p*-ethoxyphenyl, m. 94°. Refluxed with 1.5 mols. aq. NaOH they give 55-70% of the corresponding 3-aryl-2-oxazolidones, RN.CO.CH<sub>2</sub>CH<sub>2</sub>: *o*-tolyl,

b<sub>3</sub> 180-5°, d<sub>20</sub><sup>25</sup> 1.2024, n<sub>D</sub><sup>20</sup> 1.5503; *p*-tolyl, m. 91°; *o*-chlorophenyl, b<sub>3</sub> 185-8°, d<sub>20</sub><sup>25</sup> 1.2300, n<sub>D</sub><sup>20</sup> 1.5640; *p*-chlorophenyl, m. 118.5-9.0°; *p*-ethoxyphenyl (I), m. 96°. These, refluxed with 4 mols. alc. NaOH or KOH, yield 70-5% of the β-arylaminoethanols, RNHCH<sub>2</sub>CH<sub>2</sub>OH, which are more conveniently prepd. directly from the carbamates with an excess of alkali: *phenyl*, b<sub>716</sub> 280-5°, b<sub>19</sub> 167-70°, d<sub>20</sub><sup>25</sup> 1.1129, n<sub>D</sub><sup>20</sup> 1.5749; *o*-tolyl, b<sub>3</sub> 145-50°, d<sub>20</sub><sup>25</sup> 1.0962, n<sub>D</sub><sup>20</sup> 1.5675; *p*-tolyl, m. 42-3°, b<sub>4</sub> 153-5°; *o*-chlorophenyl, b<sub>3</sub> 148-52°, d<sub>20</sub><sup>25</sup> 1.2576, n<sub>D</sub><sup>20</sup> 1.5185; *p*-chlorophenyl, m. 77-7.5°; *p*-ethoxyphenyl, m. 68.5-9.0°. I is very similar to phenacetin in its antipyretic and analgesic action. C. A. R.

**Tetrahydro-1,2,3-oxazones and substituted γ-aminopropanols.** J. S. PIERCE with ROGER ADAMS. *J. Am. Chem. Soc.* **45**, 790-5 (1923); cf. preceding abstr.—*γ*-Chloropropyl chloroformate, b. 177°, d<sub>20</sub><sup>25</sup> 1.2946, n<sub>D</sub><sup>20</sup> 1.4450, is readily obtained, together with a small amt. of a substance b<sub>716</sub> 265-70° (probably *γ,γ*-dichloropropyl carbonate), from ClCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>OH in ice-salt slowly treated with 1 mol. COCl<sub>2</sub>. With 2 mols. of primary aromatic amines in H<sub>2</sub>O suspension it gives more than 80% of the following *γ*-chloropropyl arylcarbamates: *phenyl*, m. 35-6°, b<sub>3,5</sub> 190°; *o*-tolyl, m. 46-6.5°, b<sub>4,5</sub> 182.5°; *p*-tolyl, b<sub>4,5</sub> 188°, d<sub>20</sub><sup>25</sup> 1.186, n<sub>D</sub><sup>20</sup> 1.494; *o*-chlorophenyl, b<sub>3,5</sub> 178.5°, d<sub>20</sub><sup>20</sup> 1.310, n<sub>D</sub><sup>20</sup> 1.546; *p*-chlorophenyl, m. 53-3.5°, b<sub>3,5</sub> 193°; *p*-ethoxyphenyl, m. 63-3.5°, b<sub>4</sub> 198.5°; *p*-carboxyphenyl, m. 191-2.5°; *α*-naphthyl, m. 75.5-6.5°, b<sub>4</sub> 206.5°. With 1 mol. alc. KOH on the H<sub>2</sub>O bath they give 50-60% of the 3-aryltetrahydro-1,2,3-oxazones: *phenyl*, m. 94-4.5°; *o*-tolyl, m. 87-7.5°; *p*-tolyl, m. 127.5-8.0°; *o*-chlorophenyl, m. 99°; *p*-chlorophenyl, m. 111.5-2.0°; *p*-ethoxyphenyl, m. 112.5-3.0°; *p*-carboxyphenyl, m. 231-2°; *α*-naphthyl, m. 149.5-50.5°. With 4 mols. alc. KOH on the H<sub>2</sub>O bath these yield 80-100% of the *γ*-arylpropanols: *phenyl*, b<sub>20,5</sub> 180.5°, b<sub>3</sub> 154°, d<sub>20</sub><sup>20</sup> 1.073, n<sub>D</sub><sup>18</sup> 1.568; *o*-tolyl, b<sub>3</sub> 164°, d<sub>20</sub><sup>20</sup> 1.955, n<sub>D</sub><sup>20</sup> 1.560; *p*-tolyl, b<sub>3,5</sub> 163.5°, d<sub>20</sub><sup>20</sup> 1.045, n<sub>D</sub><sup>20</sup> 1.558; *o*-chlorophenyl, b<sub>3,5</sub> 151.5°, d<sub>20</sub><sup>20</sup> 1.200, n<sub>D</sub><sup>20</sup> 1.574; *p*-chlorophenyl, b<sub>3,5</sub> 167°, d<sub>20</sub><sup>20</sup> 1.205, n<sub>D</sub><sup>19</sup> 1.580; *p*-ethoxyphenyl, m. 42-2.5°, b<sub>3,5</sub> 177°; *p*-carboxyphenyl, m. 151-2°; *α*-naphthyl, b<sub>3,5</sub> 201.5°, d<sub>20</sub><sup>20</sup> 1.137. C. A. R.

**The relative stability of cyclic bases. VII. Substituted tetrahydroquinoline rings.** JULIUS V. BRAUN, JON SEEMANN and ADAM SCHULTHEISS. *Ber.* **55B**, 3803-17 (1922).—By the use of the Na-Hg method it had been found previously that *α*-methylation of the *py*-tetrahydroquinoline (I) ring does not affect its stability toward the ring-splitting addn. of H (C. A. **11**, 2785), while with the dihydroindole (II) ring a very strong effect was noted with both *α*- and *β*-methylation (C. A. **11**, 2674). To make a more exact comparison between the 2 ring systems the *β*- and *γ*-methylation of I was also examd. In both cases the N-contg. ring is split to the same extent (60%) as the I and tetrahydroquinoline rings and the direction of the splitting is the same (exclusive formation of aliphatic aromatic amines). 1,1,3-Trimethyl-*py*-tetrahydroquinolinium chloride (III) gives 40% of the 1,3-Me<sub>2</sub> deriv. (IV) of I, and 60% PhCH<sub>2</sub>CHMeCH<sub>2</sub>NMe<sub>2</sub> (V), and the 1,1,4-isomer (VI) of III gives 40% of the 1,4-Me<sub>2</sub> deriv. (VII) of I and 60% PhCHMeCH<sub>2</sub>CH<sub>2</sub>NMe<sub>2</sub> (VIII). The relations in the quinoline series are very simple as compared with those in the indole series, and it is highly probable that higher alkyl residues in the *α*-, *β*-, and *γ*-positions to the N in I would also influence the stability of the ring structure insignificantly if at all. The case must be quite different when aromatic residues are substituted. The union of N in an aliphatic aromatic residue is commonly much looser than in a purely aliphatic residue and the looseness of the union is greatest in the combination >N-C-Ph, as shown both by the BrCN method (v. B.) and by the reduction expts. of Emde; the stability of the union increases in >N-C-C-Ph, and when the N is still further removed from the aromatic nucleus the influence of the latter disappears entirely. Hence, as is naturally to be expected, in hydrogenated quinolines only the aromatic N valence is split, while in the hydroindole series usually both ring valences are split, as shown in the ac-



Under these conditions it could be predicted for the  $\alpha$ - and  $\beta$ -Ph derivs. of I that in the first at least the non-aromatic ring-valence would be loosened very extensively, and that in the second the extent of this ring splitting would not be zero, to be sure, but would be small. Expts. agreed completely with the prediction. 1,1-Dimethyl-2-phenyl-*py*-tetrahydroquinolinium chloride (IX) with Na-Hg gives almost 100% *o*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Ph (X), but the 3-Ph isomer (XI) of IX 47% 1-methyl-3-phenyl-*py*-tetrahydroquinoline (XII), 45% PhCH<sub>2</sub>CHPhCH<sub>2</sub>NMe<sub>2</sub> (XIII) and 8% *o*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CHPhMe (XIV), so that the kind of ring splitting hitherto observed only in the hydroindole series, leading to a tert. open, *o*-substituted aromatic base, was here effected to a considerable extent. Emde, who first applied Na-Hg in ring-splitting expts., at first erroneously regarded this ring-opening of hydrogenated quinolines as the normal reaction (C. A. 6, 2939); but the above results indicate it will not be encountered except with aromatic substituted compds. of types IX and XI. In further agreement with these considerations, the behavior of the *N*-alkyl derivs. of  $\alpha$ - and  $\beta$ -phenyl-*py*-tetrahydroquinolines toward BrCN is different. While XII is demethylated smoothly, like *N*-methyl-*py*-tetrahydroquinoline, without a detectable ring-opening: XII + BrCN  $\longrightarrow$  C<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CHPh.CH<sub>2</sub>.NCN (XV), in the  $\alpha$ -series such a ring opening

occurs to about 50%: C<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>CHPh.NMe (XVI) + BrCN  $\longrightarrow$  *o*-NCNMe.

C<sub>6</sub>H<sub>4</sub>CH<sub>2</sub>CH<sub>2</sub>CHPhBr (XVII). The reduction splitting expts. in the hydroquinoline series extended to an example which brings the whole complex of questions to a sure conclusion, but at the same time opens up a new field, of application. Substitution of alkyl residues in the aromatic nucleus of I causes no change in the course of the reaction. Of other substituents those contg. O are of most importance, and the question arose, whether their influence would be felt and how? To answer this question, and also to test the C<sub>6</sub>H<sub>4</sub> nucleus when more heavily loaded, 6,7-ethylenedioxy-*py*-tetrahydroquinoline (XVIII) (C. A. 17, 1965) was examd. No influence of the substituent was found. The quaternary chloride gave 6,7-ethylenedioxy-1-methyl-*py*-tetrahydroquinoline (XIX) and 80%  $\gamma$ -[3,4-ethylenedioxyphenyl]propyldimethylamine (XX). This is important because it gives a new method of approach to the phenol-bases and makes available numerous representatives of this class of substances, so interesting physiologically.  $\beta$ -Methylquinoline-Mel, reduced by Sn and HCl, gives 71% of *N*, $\beta$ -dimethyl-*py*-tetrahydroquinoline (IV), b. 130–2°; HCl-salt, very hygroscopic, m. about 110°; picrate, m. 131°; methiodide, m. 204°. IV with HNO<sub>2</sub> gives the same intense color as methylkairolin; the malachite-green reaction is equally strong. The quaternary chloride (III) corresponding to the methiodide reduced in the earlier described way in concd. soln. with Na-Hg gives a mixt. b<sub>13</sub> 120–32° of IV and V which, freed from IV by warming in HCl 16 hrs. with CH<sub>3</sub>O, made alk. and steam-distd., yield, dimethyl- $[\beta$ -methyl- $\gamma$ -phenylpropyl]amine (V), b<sub>7</sub> 100–5°, b. 221°, of decided basic odor, showing none of the above mentioned color reactions; HCl salt m. 90°; picrate, m. 87°; methiodide (formed quant. in the cold), m. 140°. *N*-Methyl-*py*-tetrahydrolepidine (VII), obtained by reduction of lepidine-Mel (Ber. 19, 3300(1886)) when warmed with MeI 0.5 hr. in a tube at 100°, gives the methiodide, m. 182°. Reduction of the corresponding methochloride (VI) gave an oil, b. 90–120° in vacuo, quickly coloring in the air, giving strong nitrite and malachite-green reactions and yielding after treatment with CH<sub>3</sub>O the amine VIII, volatile with steam, b<sub>7</sub> 112–5°, no longer showing the above color reactions; HCl salt, m. 100°; picrate, m. 98°; methiodide, m. 125°.  $\alpha$ -Phenyl-*py*-tetrahydroquinoline is completely methylated only with difficulty; when it is heated upon the water bath with 10% aq. alkali (1 mol.) and somewhat more than 2 mols. MeI for 24 hrs., cooled and made more strongly alk., and the solid lumps are sucked off over silk, dried, and extd. with Et<sub>2</sub>O, only a small amt. (13%) of the quaternary iodide, m. 185°, remains behind; the part dissolving in Et<sub>2</sub>O is the *N*-methyl- $\alpha$ -phenyl deriv. (XVI) of I, b<sub>14</sub> 188–92°, m. 101° combines with MeI only after long heating; HCl salt, m. 157°; Pt salt, m. 172°; NO compd., obtained by treating the base in H<sub>2</sub>SO<sub>4</sub> with NaNO<sub>2</sub> (the first drop gives the well known red-yellow color), adding soda, extg. with Et<sub>2</sub>O and evapg. the Et<sub>2</sub>O, green, m. 75°. With CH<sub>3</sub>O (0.5 mol.) in HCl XVI condenses to a solid diphenylmethane deriv. C<sub>25</sub>H<sub>24</sub>N<sub>2</sub> m. 60°. With oxidizers deep blue coloration occurs. The quaternary chloride (IX) whose orange Pt salt m. 203° by reduction with Na-Hg gives quant. a liquid base b<sub>13</sub> 175–88° (mostly at 180°) showing the nitrite and malachite-green reactions only very faintly; after

treatment with  $\text{CH}_3\text{O}$  in the way described only a minute non-distg. part is obtained; almost all of the product  $b_{10}$  175–8° and is the pure amine **X**; *picrate* golden yellow, m. 110°; *Pt salt* yellow-brown, m. 170°. With  $\text{MeI}$  no appreciable union occurred either in the cold or at 50°, showing that the basic complex, in accordance with formula **X**, is bound aromatically and hindered sterically, and that the base is not the isomer  $\text{PhCH}_2\text{CH}_2\text{CHPhNMe}_2$ .  $\text{BrCN}$  acting upon **XVI** on a gently boiling water bath gives a brownish green liquid completely sol. in  $\text{Et}_2\text{O}$ , from which some unchanged original base can be removed by dil. acid. The part insol. in acid is rich in Br, and since brominated cyanoamides do not distil and can be purified by crystn. only very rarely, it was warmed 1 hr. directly with excess of piperidine and acidified. A part was insol. in acid, b. 218° *in vacuo*, and solidified after cooling to a mass of indefinite m. p., shown by analysis to be formed by the brominating action of the  $\text{BrCN}$  upon **XVI**. The acid ext. gave, after making alk. and removing the piperidine with steam, a solid amorphous Br-free base uniting easily with  $\text{MeI}$  to form a brownish, microcryst. powder, which gave off  $\text{MeI}$  from 60° up without melting sharply and whose compd.,  $\text{C}_{24}\text{H}_{20}\text{N}_4$ , showed that it was a deriv. of the compd. **XVII**, in which the Br had been replaced by a piperidine residue. The yield corresponded to half of the methylated amine used, so that the ring-splitting with  $\text{BrCN}$  amounted to at least 50%; probably it is greater, i. e., if the previously mentioned acid-insol. part was really formed by bromination. Just as in the hydroindole series, the Hofmann ring splitting does not occur, even in traces, although by  $\text{BrCN}$  and  $\text{Na-Hg}$  a ring opening can be effected, so in the  $\alpha$ -phenyl-*py*-tetrahydroquinolinic series the hydroxide corresponding to **IX** proves to be the analog of dimethyldihydroindolinium and of dimethyltetrahydroquinolinium hydroxides; when the chloride is treated with  $\text{Ag}_2\text{O}$ , filtered, and *evapd.*, and the viscous residue is distd. *in vacuo*, the tert. cyclic *N*-methylated amine volatilizes quant., so that here also the dissociation leads only to a splitting off of  $\text{MeOH}$ .  $\beta$ -Phenyl-*py*-tetrahydroquinoline on exhaustive methylation acts differently from the  $\alpha$ -compd., forming quant. the quaternary *methiodide*, m. 172°. Upon dry distn. *in vacuo* it splits off  $\text{MeI}$  and yields **XII**,  $b_{12}$  195–202°, m. 42°; *picrate*, golden yellow, m. 178°; the  $\text{HCl}$  salt is oily; *Pt salt*, m. 192°; *NO compd.*, m. 105°; *diphenylmethane deriv.*,  $\text{C}_{24}\text{H}_{24}\text{N}_4$ , formed readily from  $\text{CH}_3\text{O}$ , m. 92°, is colored blue by oxidizers. When the quaternary  $\text{MeI}$  compd. is changed to the chloride (identified by the *Pt salt*, m. 204°) and treated with  $\text{Na-Hg}$ , it gives quant. a basic product,  $b_{12}$  160–200°, showing strong nitrite and malachite-green reactions, and changed considerably by condensation with  $\text{CH}_3\text{O}$ ; of the reaction product only somewhat more than half b. 160–80° *in vacuo*; the residue is identical with the above diphenylmethane deriv. The distillate,  $b_{10}$  165–75°, shows no nitrite and malachite-green reactions, and is a mixt. of **XIII** and **XIV**, sepd. with  $\text{MeI}$  in 50%  $\text{Et}_2\text{O}$ , which yields the *methiodide* of **XIII** and leaves **XIV** unchanged. *Picrate* of **XIV**, m. 166–7°;  $\text{HCl}$  salt, oily; *Pt salt*, m. 181°. The *methiodide* of **XIII** is so hygroscopic that a m. p. detn. was not made; the yellow *chlorosulfate*, m. 164°; *Pt salt*, pale yellow, m. 236°. From the ease of formation of the  $\text{MeI}$  compd., the N must be aliphatically bound, expressible only by formula **XIII**. With this formula agrees the behavior of the quaternary hydroxide whose soln. on *evapn.* and distn. *in vacuo* loses  $\text{H}_2\text{O}$  and at 140–3° there forms an oil having the compn. of  $\alpha$ -benzylstyrene with  $d_{20} 1.0143$ ,  $n_{20}^{20} 1.5903$ ,  $M_D 64.64$ . The styrene absorbs 2 atoms of Br in  $\text{CS}_2$ , giving the *dibromide*, m. 98°. When **XII** is warmed upon the water bath about 1 hr. with an equal amt. of  $\text{BrCN}$ , then treated with  $\text{Et}_2\text{O}$ , a somewhat viscous methobromide seps. (yield, 10% of the base); the  $\text{Et}_2\text{O}$  filtrate after extn. with dil.  $\text{HCl}$  leaves the *cyanide* (**XV**), m. 78°. 6,7-Ethylenedioxyquinolinemethiodide, m. 270°; reduced with Sn and  $\text{HCl}$  gave **XIX**,  $b_{10}$  165–70°, m. 53°, becoming red after some days in the air;  $\text{HCl}$  salt, m. 203°; *picrate*, m. 170°; *methiodide*, m. 220°. In pharmacological properties **XIX**, like the corresponding sec. amine (C. A. 16, 562) has only slight antipyretic action, but is highly poisonous. The *methiodide* is more easily obtained (almost quant.) by exhaustive methylation of **XVIII**. The corresponding chloride on reduction with  $\text{Na-Hg}$  gives 90% of a mixt.,  $b_{10}$  160–70°, of **XIX** and **XX**, which could not be sepd. by the usual methods (*p*-nitrosation, treatment with 0.5 mol.  $\text{CH}_3\text{O}$ ) because the position in the  $\text{C}_6\text{H}_4$  nucleus para to the N is occupied. Introduction of  $\text{CH}_2\text{OH}$  ortho to the N **XIX** by long warming with  $\text{HCl}$  and much excess of formalin, did not succeed because of the extensive resinification, probably due to the presence of the O-contg. residue. By careful fractional distn. however, the crude base was sepd. into 40% **XIX**,  $b_{10}$  168°, and 60% **XX**,  $b_{10}$  162–4°, which easily forms a *methiodide*, m. 165°; *picrate*, m. 187°;  $\text{HCl}$  salt, m. 169°. VIII. The phenomorpholine and the homotetrahydroquinoline rings. JULIUS V. BRAUN AND JON SEEMANN. *Ibid* 3818–25.—The piperidine (I) ring is so weakened in sta-

bility when the methylene group  $\gamma$  to the N is replaced by O that the morpholine (III) ring is (C. A. 12, 2556) the weakest ring among the 3 monocyclic bases (pyrrolidine, piperidine and morpholine) thus far studied. It was, therefore, important to det. the influence of replacing the  $\gamma$ -methylene by O upon the stability of the *py*-tetrahydroquinoline (III) ring (C). It was known only that the *N*-dimethylphenmorpholinium hydroxide, contrary to the analogous quaternary hydroxide of the III series, does not dissociate at high temps. with elimination of MeOH, but suffers a complete ring splitting to form *o*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OCH:CH<sub>2</sub> (Ber. 32, 733(1899)). Contrary to the monocyclic amines, with bicyclic bases with an aromatic half contg. a N attached to it, the Hofmann reaction often does not go parallel with other ring-splitting reactions, but follows its own laws; probably at the extremely high temp. at which it is carried out the stability relations of the individual ring forms at a lower temp. suffer an unequal displacement and therefore for a comparison of stability under normal conditions more value lies in reactions done at a lower temp. The authors subjected the phenmorpholine (IV) complex to the two reactions previously worked out by them for this purpose, the action of BrCN and of Na-Hg. They proved that by union of the aromatic ring to the II complex its stability is so increased that it is at least as stable as III toward BrCN, and even more stable toward Na-Hg. The reactions are: *N*-Methylphenmorpholine (V) + BrCN  $\rightarrow$  *N*-cyanophenmorpholine (VI), and *N*-dimethylphenmorpholinium chloride (VII), Na-Hg  $\rightarrow$  V, while the *N*-Me deriv. of III is also demethylated smoothly by BrCN and in *N*-dimethyl-*py*-tetrahydroquinolinium chloride the ring is opened 80%. The investigation of the stability relations of 7-membered N rings would be very desirable to clarify the relations of their 5- and 6-membered ring homologs, but it is at present scarcely feasible, owing to the difficulty of securing sufficient material for the monocyclic hexamethyleimine [CH<sub>2</sub>]<sub>6</sub> > NH. The stability of benzohexamethyleimine (homo-*py*-tetrahydroquinoline) (VIII) toward BrCN is not less than that of III, for the reaction goes to completion as follows: *N*-Me deriv. of VIII + BrCN  $\rightarrow$  *N*-cyanobenzohexamethyleimine (IX). The quaternary methohydroxide (X), like the two lower ring-homologs, is completely decompd. at higher temps. into MeOH and the *N*-Me deriv. (XI) of VIII. On comparison of the results with the 9 ring systems investigated (pyrrolidine = Py, I = Pi, II = M, dihydroindole = D, dihydroisindole = DI, III = T, *py*-tetrahydroisquinoline = TI, IV = PM, VIII = HT (C. A. 14, 1989) at first sight it would seem that with the 3 reactions used, 3 apparently quite unrelated series are obtained (the bases are arranged from left to right in order of increasing ring stability): BrCN,  $\left. \begin{matrix} \text{M} \\ \text{DI} \end{matrix} \right\} \text{D Py Pi} \left\{ \begin{matrix} \text{T} \\ \text{PM} \end{matrix} \right. \text{HT}; \text{Hofmann, Ti M DI Py Pi} \left\{ \begin{matrix} \text{D} \\ \text{T} \end{matrix} \right. \text{HT}; \text{Na-Hg}$

T D PM. The relations are really more favorable, however, for only 2 of the 9 ring systems are "disturbing" elements, DI and PM. With these out the series are congruent. It is difficult to tell what constitutional factor is of significance in the 2 bases. It is noticeable that both contain an aromatic N joined to a C chain interrupted after two CH<sub>2</sub> groups, Ar-N-CH<sub>2</sub>-CH<sub>2</sub>, and one is forced to the conclusion that this at. grouping det. certain peculiarities in behavior; it is also very striking how greatly the stability of D is affected by alkylation of either C atom of this ethylene chain and how the analogous alkylation of T is without effect. This point will be clarified by the study of PM alkylated in the CH<sub>2</sub>-CH<sub>2</sub> chain. In prep. IV, the first step being the formation of *o*-MeOC<sub>6</sub>H<sub>4</sub>NHCH<sub>2</sub>CH<sub>2</sub>OH (XI) from anisidine (XII) and ClCH<sub>2</sub>CH<sub>2</sub>OH (XIII) the method of Knorr (Ber. 22, 2095(1889)) can be simplified by working in an open vessel instead of a pressure tube. Warming for 48 hrs. on the water bath with a double excess of XIII gives 75-80% XI, together with 11% unchanged XII and some *o*-MeOC<sub>6</sub>H<sub>4</sub>N(CH<sub>2</sub>CH<sub>2</sub>OH)<sub>2</sub> whose *picrate*, m. 140°, and *HCl salt*, m. 134°. From XI, IV, b<sub>12</sub> 127-8°, is obtained in 38% yield by K.'s method. With somewhat more than 2 mols. MeI and 1 mol. NaOH on the H<sub>2</sub>O bath IV quant. yields *N*-dimethylphenmorpholinium iodide (XIV), which on dry distn. *in vacuo* quant. gives V, b<sub>1.4</sub> 124° (*picrate*, m. 144°). With BrCN heated 40 min. on the water bath V gives *N*-dimethylphenmorpholinium bromide, m. 213°. Almost 50% unchanged V and an oil, b<sub>1</sub> 115-8°, of approx. the compn. of *N*-phenmorpholyl cyanide (VI), but still contg. a little Br, which was therefore warmed 0.5 hr. at 150° with 3 mols. PhNH<sub>2</sub>.HCl, giving almost quant. the *guanidine* C<sub>6</sub>H<sub>4</sub>O.CH<sub>2</sub>CH<sub>2</sub>NC(NH)NHPh, m. 152°, whose *HCl salt* is oily, and

*Pi salt*, m. 144°. V obtained as described above or by the action of Na-Hg on VII gives with HCHO a very viscous oil, b<sub>1</sub> about 260°, having the compn. C<sub>11</sub>H<sub>10</sub>O<sub>2</sub>N<sub>2</sub>, of the expected diphenylmethane deriv.; its *dimethiodide*, m. 157°, and *picrate*, m. 160°. VIII



(C. A. 7, 1879) in MeOH with 1 mol. alkali and 2.5 mols. MeI reacts briskly, but even after 12 hrs. on the H<sub>2</sub>O bath only about 20% changes to the *tert. Me deriv.*, b<sub>10</sub> 108–10°; *methiodide*, m. 155°; *picrate*, m. 139; *HCl salt*, oily; *PI salt*, m. 186°. The combination with MeI is so slow that at 100° 15 hrs. are necessary for complete action without solvent. The *tert. amine* is formed as the only basic reaction product by treating the quaternary iodide with Ag<sub>2</sub>O, evap. the soln. and distg. the residue *in vacuo*. Heated 2 hrs. on the H<sub>2</sub>O bath with BrCN, it gives a small amt. of a thick, oily, water-sol. quaternary *bromide*, and the cyanide IX, b<sub>12</sub> 178–82°, still contg. a little Br, which with PhNH<sub>2</sub>·HCl gives the *guanidine deriv.*, m. 90°. JAMES BROWN

**Strychnos alkaloids. XXXV. Ethers of hydroxydihydrobrucinolone and the violet color reaction of the nitroquinones obtained from them.** HERMANN LEUCHS, JOHANNES GRÜSS AND HARRY HEERING. *Ber.* 55B, 3729–38 (1922); cf. C. A. 17, 1800.—Although KOH in EtOH and *b*-brucinolone or its Ac deriv. yield an easily sepd. mixt. of kryptobrucinolone (I) and ethoxydihydrobrucinolone (II) (C. A. 16, 1096), KOH in MeOH gives only a small amt. of *methoxydihydrobrucinolone* (III), prisms with 3H<sub>2</sub>O, m. 82–4°,  $[\alpha]_D^{17}$  –50.3° (AcOH); *Ac deriv.* (IV), obtained in 86% yield by acetylating 1 hr. at 100°, sinters 258°, m. 270°,  $[\alpha]_D^{15}$  –91.5° (AcOH). Heated 1 hr. at 50–60° with 5 N HNO<sub>3</sub> III gives about 20% of a red-yellow *compd.*, probably the “nitroquinone hydrate,” C<sub>20</sub>H<sub>21</sub>O<sub>9</sub>N<sub>3</sub>, sol. in H<sub>2</sub>SO<sub>4</sub> with a yellow color changing to deep violet. The main product of the reaction of the KOH in MeOH is an apparently homogeneous substance (V), sinters 190°, m. 200–2°,  $[\alpha]_D^{14}$  –108.4° to –107° (AcOH), mol. wt. 371–432, sepg. from H<sub>2</sub>O or aq. alcs. in crystals with 9–19% H<sub>2</sub>O, m. 70°, lose H<sub>2</sub>O at 100–5°, resolidify and m. again 200–2°. With Ac<sub>2</sub>O–NaOAc at 100°, V gives about 30% each of IV and of the *Ac deriv.* of I. I with NH<sub>3</sub> in MeOH at 100° yields 30–40% of the amine C<sub>21</sub>H<sub>23</sub>O<sub>4</sub>N<sub>3</sub> (VI) formerly obtained in smaller amt. by similar treatment of crude acetyl-*b*-brucinolone (C. A. 8, 1427); that in the latter case it was produced from admixed I was confirmed by the fact that from the mother liquors of such a crude product considerable amts. of VI and of unchanged I were obtained after heating with NH<sub>3</sub>. V likewise yields 50–60% of VI, together with 23% unchanged V. With PhNCO in CHCl<sub>3</sub> VI gives a *compd.* C<sub>24</sub>H<sub>25</sub>O<sub>4</sub>N<sub>4</sub>, m. 200°, contg. 6% H<sub>2</sub>O. II dissolves in 5 N HNO<sub>3</sub> at 0° with dark red color and CHCl<sub>3</sub> exts. a yellow-red resinous “quinone” (VII), isolated as the orange *semicarbazone*, C<sub>22</sub>H<sub>23</sub>O<sub>4</sub>N<sub>3</sub>, contg. 6.1% H<sub>2</sub>O, begins to change 211°, m. 240°. The free VII is reduced by SO<sub>2</sub> to colorless amorphous flocks; with 5 N HNO<sub>3</sub> at 50–60° it gives 70–80% of a “nitroquinone hydrate,” C<sub>21</sub>H<sub>23</sub>O<sub>4</sub>N<sub>3</sub> (VIII), contg. 2.35–2.6% H<sub>2</sub>O, whose light yellow *semicarbazide* contains 7.97% H<sub>2</sub>O. VIII differs from the otherwise analogous nitroquinones C<sub>19</sub>H<sub>15</sub>O<sub>7</sub>N<sub>3</sub> (IX), obtained in the same way from brucinolone, I and isobrucinolone, only in having taken up 1 more mol. of H<sub>2</sub>O but this difference produces a markedly different behavior towards SO<sub>2</sub>; to be sure, two H atoms are taken up in every case but only IX yield stable yellow hydroquinols while VIII gives an amorphous dark violet *hydroquinol* (X) with 8.4% H<sub>2</sub>O, m. around 185° (gas evolution); it is therefore completely analogous to the other violet products from nitroquinones of the brucine series which are always formed from NO<sub>2</sub> derivs. in whose production a mol. of H<sub>2</sub>O has been taken up, and it confirms the role which has been assigned to the added H<sub>2</sub>O in the violet color reaction (C. A. 16, 3091). The presence of the CO<sub>2</sub>H group in VIII was proved by the prepn. of the brown amorphous *Et ester*; only 1 alkyl group can likewise be introduced into X with formation of the violet amorphous *Me* and *Et esters*, but Ac<sub>2</sub>O–NaOAc in H at 100° gives an orange *tri-Ac deriv.*, C<sub>27</sub>H<sub>25</sub>O<sub>11</sub>N<sub>3</sub>, contg. 6% H<sub>2</sub>O, m. 175–80°. C. A. R.

**Glucosides. II. Arbutin.** A. K. MACBETH AND JOHN MACKAY. *J. Chem. Soc.* 123, 717–24 (1923).—The work described had for its object the identification of the constituent sugar and the detn. of the configuration of the glucoside, and the detection of the nature of the internal linking of the component sugar. To this end the glucoside was completely methylated by means of Me<sub>2</sub>SO<sub>4</sub> and NaOH to *pentamethylarbutin*, m. 75.5° [also prepd. by heating tetramethylglucose with an equiv. of *p*-HOC<sub>4</sub>H<sub>9</sub>OMe in dry C<sub>6</sub>H<sub>6</sub> with 0.25% HCl],  $[\alpha]_D^{15}$  –43.2° in AcMe, –48.2° in EtOH, –41° in CHCl<sub>3</sub>. On hydrolysis with MeOH contg. 1% HCl pentamethylarbutin was resolved into hydroquinol derivs., tetramethylglucose, and  $\alpha$ - and  $\beta$ -tetramethylmethyglucosides, which latter on further treatment with aq. 8% HCl yielded a *cryst. tetramethylglucose*. This product was identified as the 2,3,5,6- or butylene oxide *compd.*, from which it follows that arbutin is derived from a mol. of *d*-glucose combined with hydroquinol, the internal linking of the sugar being of the butylene oxide type; and hence the following structure is established for the glucoside: HOCH<sub>2</sub>CH(OH)CH<sub>2</sub>CH(OH)CH(OH).CHOC<sub>4</sub>H<sub>9</sub>OH.

This structure is further supported by the above cited synthesis of pentamethylarbutin from  $p\text{-HOC}_6\text{H}_4\text{OMe}$  and tetramethylglucose. W. O. E.

**The nucleotides formed by the action of boiled pancreas on yeast nucleic acid.** WALTER JONES AND M. E. PERKINS. *J. Biol. Chem.* 55, 557-65 (1923).—The crude mixt. of nucleotides obtained by the digestion of nucleic acid with a boiled  $\text{H}_2\text{O}$ -ext. of pig pancreas (cf. *C. A.* 14, 2489; 16, 1253), was made alk. with  $\text{NH}_4\text{OH}$  and treated with an equal vol. of abs.  $\text{EtOH}$ . The pptd.  $\text{NH}_4$  salt of guanine nucleotide was filtered out, dissolved and reprecipd., then converted into the Pb and finally into the brucine salt. Only a small yield of the last was obtained but, upon adding  $\text{EtOH}$  to the mother liquid, acid brucine guanine nucleotide,  $\text{C}_{22}\text{H}_{22}\text{N}_2\text{O}_8\cdot\text{H}_3\text{PO}_3\cdot\text{C}_8\text{H}_7\text{O}_3\cdot\text{C}_8\text{H}_7\text{N}_3\text{O}_4\cdot\text{H}_2\text{O}$ , was pptd. The  $\text{H}_2\text{O}$ - $\text{EtOH}$  filtrate from the  $\text{NH}_4$ -guanine nucleotide was treated with increasing amts. of  $\text{EtOH}$  until tests of the filtrate showed the absence of combined guanine. Some additional  $\text{EtOH}$  was added and the ppt., consisting of a mixt. of  $\text{NH}_4$  nucleotides, was filtered out. The nucleotides in the filtrate were converted into their Pb and then into the brucine salts. These were then crystd. 9 times from 35%  $\text{EtOH}$ . The least sol. portion was brucine uracil nucleotide. The yield was unexplainably small. The most sol. portion yielded pure brucine adenine nucleotide. The intermediate fractions were converted into the Pb salt, which, after partial decompn. with  $\text{H}_2\text{S}$  and evapn. at  $45^\circ$  yielded a Pb  $\text{NH}_4$  cytosine nucleotide,  $\text{Pb}(\text{NH}_4)_2\text{O}_2\text{PO}_4\cdot\text{C}_8\text{H}_7\text{O}_3\cdot\text{C}_8\text{H}_7\text{N}_3\text{O}_4$ . The nucleotides in yeast nucleic acid are believed to be united, in part, through carbohydrate to carbohydrate linkage and, in part, through the union of the  $\text{H}_2\text{PO}_4$  of one nucleotide to the pentose of another. Cf. following abstr.

I. GREENWALD

**The formation of nucleotides from yeast nucleic acid by the action of sodium hydroxide at room temperature.** WALTER JONES AND M. E. PERKINS. *J. Biol. Chem.* 55, 567-8 (1923); cf. preceding abstr.—50 g. nucleic acid were suspended in 1250 cc.  $\text{H}_2\text{O}$  and  $\text{NaOH}$  was added slowly until all the nucleic acid had been dissolved and a neutral soln. obtained. 50 cc. of 20%  $\text{NaOH}$  were then added and the mixt. was set aside at room temp. for 3-4 hrs. No  $\text{H}_3\text{PO}_4$  nor purines were set free but there was a progressive diminution in the titratable alkyl. (phenolphthalein). The amt. of ppt. produced by the addn. of  $\text{H}_2\text{SO}_4$  or of  $\text{HCl}$  diminished, the former the more rapidly, until finally none was produced by either acid. From the final product, mononucleotides were isolated in amts. suggesting that the reaction was quant. Unexpectedly large quantities of cytosine nucleotide were obtained without the use of brucine.

I. GREENWALD

**Lysolecithins and lysocephalins.** P. A. LEVENE AND IDA P. ROLF. *J. Biol. Chem.* 55, 743-9 (1923).—Upon applying the usual methods of prep. and sepg. lecithin and cephalin to the product of the reaction of cobra venom and a mixt. of eggs and  $\text{H}_2\text{O}$ , there were obtained substances which appeared to be derived from lecithin and cephalin by the loss of the unsatd. fatty acid. The names lysolecithin and lysocephalin are proposed. No I absorption was observed but palmitic and stearic acids, choline and aminoethanol were isolated. The fractions obtained contained from 7 to 33% lysocephalin.

I. GREENWALD

**$\beta$ -Amyrin from Manila elemi resin.** ALEXANDER ROLLETT AND KLOTHILDE BRATKE. *Monatsh.* 43, 685-8 (1923); cf. *C. A.* 17, 1435.—Hydroxy- $\beta$ -amyrin acetate, by oxidation of  $\beta$ -amyrin in  $\text{AcOH}$  with  $\text{K}_2\text{S}_2\text{O}_8$ , m.  $291-2^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with yellow color and red-violet fluorescence. Sapon. with 10%  $\text{MeOH}$ - $\text{NaOH}$  gives hydroxy- $\beta$ -amyrin, m.  $200-1^\circ$ . With  $\text{CrO}_3$  in  $\text{AcOH}$  this is transformed into hydroxy- $\beta$ -amyranone, m.  $216-7^\circ$ , the oxime of which m.  $248-51^\circ$ .

C. J. WEST

**Hydrogenation of phenols by Na formate and CO (FISCHER, SCHRADER) 21.** Bases from crude coal tar (GOLLMER) 21. Electrolytic and chemical chlorination of benzene (LOWY, FRANK) 4.

**Urea.** W. GAUS, W. MEISER AND E. EBERHARDT. U. S. 1,453,069, Apr. 24. An  $(\text{NH}_4)_2\text{CO}_3$  soln. is heated under pressure, the vapors are liquefied to form a melt of moist  $\text{NH}_4$  carbamate and the latter is heated to a urea-producing temp. while still under the pressure generated.

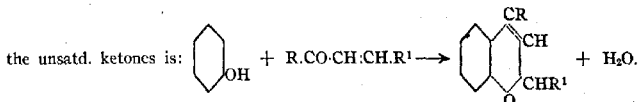
**Phenyglycine and its alkali salts.** YOSHISATO TAWARA AND THE MITSUI KÔZAN KABUSHIKI KAISHA. Japan. 41,080, Dec. 13, 1921. Phenyglycine is prepd. from  $\text{C}_6\text{H}_5\text{NH}_2$  and  $\text{CH}_2\text{ClCO}_2\text{H}$ .  $\text{HCl}$  produced is removed with  $\text{NH}_4\text{OH}$ . 100 kg.  $\text{CH}_2\text{ClCO}_2\text{H}$  is dissolved in 100 kg.  $\text{H}_2\text{O}$ , added to 200 kg. of  $\text{C}_6\text{H}_5\text{NH}_2$  and heated at  $80^\circ$  during 2 hrs. under agitation. When cooled 18 kg.  $\text{NH}_3$  in  $\text{H}_2\text{O}$  is added to the product and the aq. layer of  $\text{NH}_4\text{Cl}$  is sepd. from the oily layer, the latter is mixed with 60 kg.

of KOH in 300 kg. H<sub>2</sub>O and subjected to vacuum distn. at above 60° for the sepn. of C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>.

**Alkyl dihydroxynaphthylbenzoates.** SOC. ANON. POUR L'INDUSTRIE CHIMIQUE A BALE. Swiss 90,806, 91,106. 1,5- or 1,6-Dihydroxynaphthyl-*o*-benzoic acid is esterified in the usual way with aliphatic alcs. *Allyl 1,6-dihydroxynaphthyl-*o*-benzoate* forms white, prismatic needles, m. 128°. *Ethyl 1,6-dihydroxynaphthyl-*o*-benzoate* forms slightly yellow crystals, m. 156°. *Ethyl 1,5-dihydroxynaphthyl-*o*-benzoate* forms white needles, m. 146°.

J. C. S.

**Condensation products of  $\alpha,\beta$ -unsaturated ketones and phenols.** CHEM. FABRIKEN VORM. WEILERTER MEER. Ger. 357,755.  $\alpha,\beta$ -Unsatd. ketones, in the presence of acids, or their acid additive products are condensed with phenols. The reaction in the case of



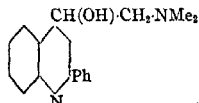
With reactive phenols such as resorcinol or *N*-substituted *m*-aminophenols the reaction is almost quant. The compound from the condensation of phenol and styryl methyl ketone is a gray powder. The compound from the condensation of phenol and styryl methyl ketone is a yellow powder. The compound from the HCl additive product of phenyl styryl ketone (3-chloro-1-keto-1,3-diphenylpropane) and resorcinol has a red color; it forms an Ac deriv. Other condensation products are formed from phenyl *m*-hydroxystyryl ketone and pyrogallol (brown); from phenyl styryl ketone and pyrogallol (bluish gray); from phenyl *p*-dimethyl aminostyryl ketone and *m*-dimethylaminophenol (grayish blue); from resorcinol and thiodiketobenzylidenethiazolidine (reddish brown); from styryl methyl ketone and *p*-cresol (light brown); from *p*-acetamidophenyl *o*-chlorostyryl ketone and quinol (reddish violet).

J. C. S.

**Aminopyridines.** CHEMISCHE FABRIK AUF ACTIEN (VORM. E. SCHERING). Ger. 358,397. NH<sub>3</sub> is allowed to act on pyridine or its homologs in the presence of alkali metals. E. g., anhyd. pyridine at 80° is added to a suspension of finely divided Na in toluene and anhyd. NH<sub>3</sub> is passed in. After the Na is used up the temp. is raised to 130° and so maintained until no more NH<sub>3</sub> is absorbed. From the products of the reaction, by extg. with ether, distg. off the ether and fractionation of the residue, 2-aminopyridine, b<sub>20</sub> 103-10°, 4,4'-dipyridyl, b<sub>20</sub> 173-80°, and 4-aminopyridine are obtained. 6-Amino-2-methylpyridine, a yellow oil, b<sub>20</sub> 120-30°, is similarly prepd. from 2-methylpyridine ( $\alpha$ -picoline).

J. C. S.

**Amino alcohols of the quinoline series.** SOC. ANON. POUR L'INDUSTRIE CHIMIQUE A BALE. Swiss 92,001, 92,607-819. 2-Phenyl-4-quinolyl methyl ketone is halogenated on the Me group and the halogen deriv. allowed to react with primary or secondary amines. The *N*-alkyl-2-phenylquinolyl 4-aminomethyl ketone thus formed is reduced to the amino alc. 2-Phenyl-4-quinolyl methyl ketone, yellow crystals, m. 75°, is prepd. by condensation of ethyl 2-phenylquinoline-4-carboxylate with EtOAc and elimination of CO<sub>2</sub> from the intermediate ethyl 2-phenylquinoline-4-acetate, m. 52-4°, or from 4-cyano-2-phenylquinoline by Grignard's reaction. By the action of Br on the ketone, 2-phenyl-4-quinolyl bromomethyl ketone hydrobromide is obtained; it forms yellow crystals, m. about 225° (decompn.). The free bromomethyl ketone forms light yellow crystals, m. 91°. With dimethylamine it gives 2-phenyl-4-quinolyl-4-dimethylaminomethyl ketone, which forms a hydrochloride, light yellow crystals, m. 208° (decompn.), and a hydrobromide, m. about 206°. Reduction of this compd. gives  $\beta$ -dimethylamino- $\alpha$ -2-phenylquinolyl ethanol (annexed formula), a white, plastic mass. The dihydrochloride forms crystals, m. 175° (decompn.). 2-Phenyl-4-quinolyl diethylaminomethyl ketone is similarly prepd.;



the hydrobromide forms yellow, felted needles, m. about 188° (decompn.). 2-Phenyl-4-quinolyl piperidinomethyl ketone gives a hydrochloride, m. 235°, and a hydrobromide, m. about 241° (decompn.). 2-Phenyl-4-quinolyl anilinomethyl ketone forms yellow

crystals, m. 123–5°. These ketones may be reduced to the corresponding amino alcs.  $\beta$ -Diethylamino- $\alpha$ -2-phenyl-4-quinolyethanol gives a dihydrochloride which forms crystals, m. about 185°, with darkening.  $\beta$ -Piperidino- $\alpha$ -2-phenyl-4-quinolyethanol gives a dihydrochloride, m. about 199° (decompn.).  $\beta$ -Anilino- $\alpha$ -2-phenylquinolyethanol,  $C_6NH_5Ph \cdot CH(OH) \cdot CH_2 \cdot NHPh$ , m. 146°.

J. C. S.

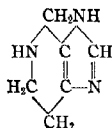
A primary amino alcohol of the quinoline series. SOC. ANON. POUR L'INDUSTRIE CHIMIQUE A BÂLE. Swiss 92,301; cf. preceding pat. 2-Phenyl-4-quinolyl methyl ketone is changed into its oximino deriv. and this is submitted to reduction. 2-Phenyl-4-quinolyl oximinomethyl ketone forms yellow crystals, m. 182° (decompn.). By reduction,  $\beta$ -amino- $\alpha$ -2-phenyl-4-quinolyethanol,  $C_6NH_5Ph \cdot CH(OH) \cdot CH_2 \cdot NH_2$ , is obtained. It forms a dihydrochloride, colorless crystals, m. about 190° after softening at about 145°.

J. C. S.

Chloro-substitution products of hexamethylenetetramine. ROMOLO BURATTI. Swiss 90,703. An aq. soln. of  $(CH_2)_6N_4$  is mixed with a soln. of a hypochlorite, previously neutralized with an org. or weak mineral acid, and the mixt. concd. to the point of crystn. With neutral NaClO contg. 10% of active Cl, the reaction is as follows:  $C_6H_{12}N_4 + 4HClO = C_6H_8N_4Cl_4 + 4H_2O$ . The tetrachlorohexamethylenetetramine thereby formed seps. on concn. of the soln. as a colorless mass; it forms salts with acids.

J. C. S.

A condensation product from  $\beta$ -iminazolyethylamine [4- $\beta$ -aminoethylglyoxaline]. SOC. ANON. POUR L'INDUSTRIE CHIMIQUE A BÂLE. Swiss 92,297. When  $CH_3O$  or, preferably, methylal is added slowly to a suspension of 4- $\beta$ -aminoethylglyoxaline in fuming HCl at 100° and the mixt. heated for several hours in a reflux app.,  $\beta$ -imidazolyl-



isopiperidine (annexed formula) is formed. The hydrochloride is cryst. and m. 249°.

J. C. S.

A quinine derivative. AKTIEN-GESELLSCHAFT FÜR ANILIN-FABRIKATION, JULIUS ALTSCHUL and MARCELL BACHSTEZ. Ger. 357,753. Equimol. amts. of quinine and 4-ethoxyphenylmalonic acid are fused together and crystd. from hydrolyzing solvents or allowed to react as such or in form of their salts in the presence of hydrolyzing solvents. Quinine 4-ethoxyphenylmalonamate forms long, colorless needles, m. 72–3°.

J. C. S.

Inositolpolyphosphate. SVIGEL POSTERNAK. Swiss 91,727; cf. C. A. 15, 1891. A soln. of inositol is heated with excess of orthophosphoric acid in the presence of sufficient excess of  $P_2O_5$  to combine with the water produced in esterification. The resulting products are dissolved in dil. NaOH soln. and the Na metaphosphate is changed into Na pyrophosphate by heating at 100°. The latter salt is fractionally crystd. out from the viscid soln. of the Na salt of inositolpolyphosphate. Other metallic inositolpolyphosphates may be obtained from the Na salt by double decompn. Ca, Mg and ferric salts are mentioned and a cryst. calcium sodium salt having the compn.  $C_6H_{10}O_6P_4 \cdot Na_2Ca_3 \cdot 3H_2O$  is also obtained; it probably occurs in seeds.

J. C. S.

Complex silver compounds of aromatic thiocarbamides. F. HOFFMANN-LA ROCHE & Co. Swiss 90,808, 91,780; cf. C. A. 17, 1803.—Aryl thiocarbamides of the compn.  $Ar \cdot NH \cdot CS \cdot NH_2$ , the aryl group being substituted or unsubstituted, in excess are treated with Ag salts such as AgCl or  $AgNO_3$ . The complex silver compds. of the *p*-hydroxyphenylthiocarbamide of *p*-thiocarbamidosalicylic acid,  $OH \cdot C_6H_3(CO_2H) \cdot NH \cdot CS \cdot NH_2$ , m. 221°, are thus prepd. The latter compd. is prepd. from 4-aminosalicylic acid hydrochloride and  $NH_4CNS$ . The complex silver compd. of 6-amino-3-thiocarbamido-10-methylacridine (from 3,6-diamino-10-methylacridinium chloride) is also mentioned.

J. C. S.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The inland lakes of Wisconsin. The Plankton. I. Its quantity and chemical composition. E. A. BIRGE AND CHANCY JUDAY. Wisconsin Geological and Natural History Survey, *Bull.* No. 64, Scientific Series No. 13. E. J. C.

The physiological importance of phosphoric acid. FRITZ LAQUER. *Naturwissenschaften* 11, 300-4(1923).—A review with a bibliography. C. C. DAVIS

Industrial mold enzymes. KOKICHI OSHIMA AND MARGARET B. CHURCH. *Ind. Eng. Chem.* 15, 67-70(1923).—A quant. study of a series of related molds of industrial importance to det. their relative values as sources of enzymes. A new method for the quant. detn. of protease is described. HARRY J. DEWAL, JR.

Studies on enzyme action. XXII. The lipolytic actions of various tissue and tumor extracts at different hydrogen ion concentrations. HELEN MILLER NOYES, KANEMATSU SUGIURA AND K. G. FALK. *J. Biol. Chem.* 55, 653-69(1923).—Tissue exts. derived from various sources were tested for their action on glycerol triacetate (a) in mixts. in which the initial  $p_H$  varied from 4 to 9 and (b) in mixts. in which the ester was not added until after adjustment to  $p_H$  7.0, after previous holding of the tissue ext. at  $p_H$  4 to 9 for 12-24 hrs. at room or ice-box temp. One ext. of beef spleen and 1 of a human tumor were similarly tested with  $PhOAc$ ,  $MeOBu$ ,  $PhCH_2OAc$ ,  $EtOAc$ ,  $MeOAc$ ,  $EtOBu$ ,  $MeOBz$ ,  $EtOBz$ ,  $CH_3EtCH_2OAc$ ,  $Ph_3PO_4$ ,  $Me$  salicylate and olive oil and several other exts. were tested with several of these esters. The rate of inactivation of the esterase was least between  $p_H$  6 and 7. The rate of hydrolysis rapidly diminished as the acidity was increased but in the more alk. mixts., the increase in activity due to the increased activity of the enzyme more than compensated for its increased destruction. No optimum reaction for the activity of the enzyme could be detd. I. GREENWALD

The part played by electrolytes in the heart beat, the action of sodium chloride after exhaustive bleeding, and the so-called tonus current. F. KRAUS AND S. G. ZONNENK. *Klin. Wochschr.* 1, 996-7(1922).—When an isolated frog heart is nourished with a Ringer soln. contg. an increased amt. of K, the force of the ventricular contraction is rapidly reduced; the alky. of the surrounding nutrient fluid is slightly increased (indicator method, neutral red or rosolic acid). Similar results are obtained with a Ringer soln. to which atropine has been added. A Ringer soln. contg. an increased amt. of Ca temporarily increases the contraction force of the heart muscle; the alky. of the surrounding nutrient fluid is slightly reduced. MILTON HANKE

Biological differences in the behavior of blood. KJ. VON OETTINGEN. *Klin. Wochschr.* 1, 1161-2(1922).—Of the citrated plasma 0.5 cc. were mixed with 0.2 cc. of a 0.1% soln. of snake venom and incubated for 24 hrs. Plasma from the newborn is not coagulated; normal plasma (from adults) is only slightly coagulated if at all; but plasma from a pregnant woman is solidly coagulated. 0.5 cc. of citrated plasma was treated with 1 cc. of a  $CaCl_2$  soln. Plasma from the newborn was coagulated in 10-15 min., normal (adult) plasma coagulated less rapidly and plasma from a pregnant woman coagulated least rapidly. A  $CaCl_2$  concn. of 0.25 to 0.125% was optimal. After standing for some time, gravid plasma was most solidly coagulated, new born plasma least so. When the plasmas are dild. sufficiently with water the results obtained with  $CaCl_2$  are the reverse of those recorded for concd. plasma. MILTON HANKE

Combination between oxygen and hemoglobin, and the criteria of adsorption. N. K. ADAM. *Nature* 111, 496-7(1923).—Largely polemical. A process is rightly called adsorption, according to A., "if the substance taken up by the surface continues to be taken up until the whole surface is uniformly covered." Hemoglobin and O combine in the ratio of 16,670 to 32 (by wt.), which implies that the attraction of the one substance for the other "is a highly localized property of the hemoglobin particles." A.'s definition of adsorption would therefore exclude the combination of O and hemoglobin. BENJAMIN HARROW

Enzymic desaminization of asparagine. A. CLEMENTI. *Arch. intern. physiol.* 19, 369-98(1923); *Physiol. Abstracts* 7, 403(1922).—Asparaginase, an enzyme which desaminizes asparagine, occurs in the blood serum of the guinea pig, the liver of the albino rat, pig, and guinea pig, the liver and kidney of certain birds; it was not found in other vertebrates and invertebrates. Its action *in vitro* may be followed by means of the

formol titration. Its presence in the animal body is attributed to an adaptation of the organism to a diet rich in asparagine.

JOSEPH S. HEPBURN

**Enzymic desaminization of asparagine in different animal species and the physiological significance of the presence of the enzyme.** A. CLEMENTI. *Atti. accad. Lincei* 30, 198-200(1921); *Physiol. Abstracts* 7, 403(1922).—Asparaginase occurs in certain vertebrates but not in man, in the mammalian herbivora generally, and in single organs of omnivora. It is present as a sp. reaction to the occurrence of asparagine in the food.

JOSEPH S. HEPBURN

**Anaerobic and aerobic oxidation of xanthine and hypoxanthine by tissues and by milk.** E. J. MORGAN, C. P. STEWART AND F. G. HOPKINS. *Proc. Roy. Soc. (London)* 94B, 109-31(1922).—In the presence of methylene blue, certain animal tissues are able to produce oxidation of xanthine and hypoxanthine to uric acid in a strictly anaerobic environment. Oxidation is apparently produced by the same catalytic system under both aerobic and anaerobic conditions. Milk contains a highly specific catalyst which produces rapid oxidation of the bases in both an aerobic and an anaerobic environment in the presence of methylene blue; only xanthine and hypoxanthine are directly attacked; the adenase of milk converts adenine into hypoxanthine which is then attacked by the catalyst. When the 2 bases are present in equimol. concn. in an anaerobic environment, hypoxanthine reduces twice as fast as xanthine; uric acid is therefore produced from both bases at equal velocity, probably by the same catalyst. When fresh milk acts in an aerobic environment, hypoxanthine requires twice as long a time as xanthine for the complete conversion into uric acid. The tissues of the rat oxidize both bases either aerobically or anaerobically.

JOSEPH S. HEPBURN

**Studies on enzyme action. XXIII. Homo- and heterolytic enzymes.** H. E. ARMSTRONG. *Proc. Roy. Soc. (London)* 94B, 132-3(1922); cf. *C. A.* 9, 327.—The conversion of xanthine and hypoxanthine into uric acid by enzymes (cf. preceding abstr.) is attributed to hydrolysis. While ordinary hydrolytic (homolytic) enzymes distribute the elements of  $H_2O$  between 2 sections of a single mol., these hydrolytic enzymes are heterolytic and distribute the elements of  $H_2O$  between 2 distinct mols.

JOSEPH S. HEPBURN

**The activation of an enzyme poisoned by heavy metal salts.** R. A. KEHOS. *J. Lab. Clin. Med.* 7, 736-42(1922).—The enzyme in saliva coagulated and rendered inactive through the action of  $HgCl_2$  and  $AgNO_3$  may be reactivated by means of sufficiently high concns. of neutral salts of the alkali and alk. earth metals. The chlorides, bromides, iodides and thiocyanates of  $NH_4$ , K, Na, Sr, Ba, Ca and Mg were effective, while the nitrates, sulfates, citrates, acetates and carbonates were not. Resoln. of the ppt. and return of starch-splitting activity occurred simultaneously. About 80% of the starch-splitting activity was restored. The enzyme is probably a protein, or is intimately associated with a protein, which is sol. and active only when combined with certain salts or metals. It is capable of forming with other inorg. salts a series of metal-protein-acid compds., analogous in soln. and hydration capacity to the soaps formed by the neutralization of fatty acids with metallic hydroxides. Such heavy metal salts as inactivate the enzyme do so through the formation of insol. dry heavy metal-protein-acid compds., thus removing the active catalyst from soln.

E. R. LONG

**Reply to the remarks of Handovsky regarding my paper: "The colloidal chemical significance of physiological ion antagonisms."** S. M. NEUSCHLOZ. *Arch. ges. Physiol. (Pflüger's)* 187, 136-8(1921); cf. *C. A.* 16, 2336.—No new facts are presented. It is reaffirmed that ion antagonisms follow the same general laws in inanimate colloidal systems as in biol. processes.

G. H. S.

**Autoxidations. II. Conversion of cysteine into cystine under different conditions.** EMIL ABDERHALDEN AND ERNST WERTHEIMER. *Arch. ges. Physiol. (Pflüger's)* 198, 122-7(1923); cf. *C. A.* 17, 1810.—Iron is not essential to the oxidation of cysteine. In iron-free preps. the autoxidation is inhibited by KCN. Narcotics, such as the alcs., also inhibit the process.

G. H. S.

**The influence of neutral alkali metal salts on diastatic enzyme.** V. AMANDUS HAHN AND HUGO MEYER. *Z. Biol.* 76, 227-46(1922); cf. *C. A.* 16, 1595.—Purified diastase from com. pancreatin "Rhenania" is influenced as regards its activity by the presence of neutral salts of the alkali metals similarly to saliva diastase, and to unpurified pancreatin. The optimum  $p_H$  depends on the buffer soln. used, being 7.2 with a phosphate mixt. and 5.6 with an acetate mixt., resembling saliva which has a corresponding optimum at  $p_H$  6.6 and  $p_H$  5.6. The influence of neutral salts is much more marked with acetate buffer mixts. than with phosphate buffer mixts. In both cases the effect is to increase the optimum  $p_H$ .

J. C. S.

The solubility of the salts of uric acid. GEORG BARKAN. *Z. Biol.* 76, 257-66 (1922).—The soly. of freshly pptd. amorphous Na urate ( $C_4H_3O_7N_4Na.H_2O$ ) at 18° is 2.03 g. or  $9.8 \times 10^{-3}$  g.-mols. per l. On keeping, or more particularly on stirring in contact with its soln., the soly. decreases, and approaches that of the cryst. form. J. C. S.

Gaseous interchange in the stomach in the anesthetized animal. NORA EDKINS. *J. Physiol.* 56, 421-5 (1922).—There is no accumulation of  $CO_2$  in the empty stomach. When  $N_2$ ,  $N_2$  and  $O_2$ , or  $N_2$  and saline were introduced into the fasting stomach the  $CO_2$  reached a fairly const. level, varying between 5.5% and 6.5% of an atm. During activity (gastric stimulation) in the absence of food the  $CO_2$  rose to about 7.5% and the  $O_2$  remained about 1%. Since alveolar  $CO_2$  pressure was always found to be lower than gastric  $CO_2$  and  $O_2$  pressure very much greater, the conclusion may be drawn that the tension of  $CO_2$  in this tissue is greater than that of the venous blood and that the tension of  $O_2$  is of a very low order. Conclusion: The presence of  $CO_2$  in the stomach is due to the passive diffusion from the tissues of the wall of the stomach into the cavity. J. F. LYMAN

Filtration of ultravirus neurotropes through collodion membranes. C. LEVADITI and S. NICOLAU. *Compt. rend.* 176, 717-20 (1923).—Sacks of Poulenc collodion were hermetically attached to glass tubes and sterilized for 10 min. at 110°. Filtrations were made under a pressure of 10 to 12 cm. of Hg. Five samples of rabic virus were thus filtered and but one of the filtrates was virulent. Only 1 of 6 filtrates of encephalic virus gave a positive reaction. Two samples of herpetic virus were active after filtration and of 8 samples of neurovaccine the filtrates of 7 gave positive reactions. L. W. RIGGS

Production and estimation of the hydrogen-ion concentration in "Nadi" mixtures. SIEGFRIED GRÄFF. *Z. allgem. Physiol.* 20, 85-99 (1922).—Mixts. of  $\alpha$ -naphthol and dimethyl-*p*-phenylenediamine form indophenol blue in the presence of plant and animal tissues. The  $p_H$  of the mixt. and the degree of buffering exert a great influence upon the reaction. The colorimetric method is used for the detns. G. H. S.

Guanylnucleic acid. R. FEULGEN. *Z. physiol. Chem.* 123, 145-58 (1922).—This is a critical discussion largely of Hammarsten and Jorper's work (*C. A.* 16, 2523) concerning the nature of the polynucleotide with which guanylic acid is bound in the guanylnucleic acid of the pancreas. F. is of the opinion that it is thymus nucleic acid or something very similar and that it certainly does not contain a pentose. R. L. STEHLÉ

The classification of nucleic acids and the place of guanylnucleic acid in the system. R. FEULGEN. *Z. physiol. Chem.* 123, 197-204 (1922).—The classes are: (1) nucleic acids contg. pentoses; (2) nucleic acids which, after the splitting off of the purines, give a reaction with Schiff's reagent and a green pine splint test; (3) nucleic acids conforming to both 1 and 2. The last group contains compd. or mixed nucleic acids such as guanylnucleic acid. R. L. STEHLÉ

Several extractive substances of human skeletal muscle. R. ENGLAND and W. BIEHLER. *Z. physiol. Chem.* 123, 290-4 (1922).—The lysine fraction was investigated particularly. From it carnitine, neosine, myokynine and a new base,  $C_{11}H_{18}N_4O_6$ , to which the name *murgeline* is given, were isolated. Neosine chloroaurate was found to m. 244-5° instead of 205° as found by Kutcher. R. L. STEHLÉ

Recent researches on enzymes. H. LÜERS. *Z. angew. Chem.* 35, 669-71 (1923).—A review. J. J. W.

A hitherto unknown enzyme effect and its bearing on assimilation. J. L. P. SPOHR. *Schweiz. Apoth. Ztg.* 61, 55-6 (1923).—Expts. to revivify enzymes of the dried stomachs of ruminants led to the discovery of "novochimosin" (A), no doubt the original enzyme in the living stomach. It not only coagulates casein of milk, it also converts albumins into albumose and peptones, and protects these from the attack of putrefactive bacteria by digesting them, aided by the HCl of the gastric juice. The peptonizing effect was not retarded at 12°, and was rather promoted at 58-9°; the albumose soln. remained clear and odorless for months; only some penicillia finally formed on the surface. A is no doubt the governing factor in the process of assimilation of albumin, and a valuable therapeutic, bactericidal agent in fermentative and infectious troubles of the stomach and intestines. (The mode of prepn. of A is not given.) S. WALDBOTT

Hydrogen-ion concentration (HILL) 2. Chemical composition of living matter and the chemistry of the earth's crust (Vernadsky) 8. Lysoleithins and lysocephalins (Levene, Rolf) 10. Formation of nucleotides from yeast nucleic acid (JONES, PERKINS) 10. Nucleotides formed by the action of boiled pancreas on yeast nucleic acid (JONES, PERKINS) 10. Fermentation (WILSTÄTTER, SOBOTKA) 16.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**Measurement of sugar by picrate-picric acid in slightly albuminous fluids; two clinical methods.** W. MESTREZAT AND MISS Y. GARREAU. *Bull. soc. chim. biol.* 5, 41-58(1923).—The picrate method is suitable for cerebrospinal fluid and albuminous fluids contg. less than 5 g. protein per l. It is not suitable for retention fluids contg. much N. Neither are the usual Cu methods. Such fluids should be pptd. by Patein's reagent. The picrate method can be used as a micro-method, only 0.1 cc. fluid being used.

A. T. CAMERON

**Estimation of nitric nitrogen and total nitrogen in plant tissue extracts.** P. H. GALLAGHER. *J. Agr. Sci.* 13, 63-8(1923).—The Al amalgam, Zn-Cu couple, Devarda, and Ulesch methods were studied as applied to the detn. of nitrate N in vegetable roots. A method based upon the use of Devarda's alloy and magnesia, in lieu of NaOH, is recommended. In the estn. of  $\text{NO}_3$  in plant exts. colloidal matter is first pptd. by an equal vol. of alc. An aliquot of the filtrate contg. the equiv. in nitrate N of approx. 0.1 g. of  $\text{KNO}_3$  is distd. with steam with 1 g. of Devarda's alloy and 0.5 g. of ignited magnesia. The distn. is continued for 45 min. and a blank is run upon a sep. portion of the filtrate for the same length of time with the same amt. of magnesia.

R. B. DEEMER

**Microchemical detection of urea.** A. PIRAS. *Arch. fisiol.* 20, 237-43(1922); *Physiol. Abstracts* 7, 474.—The xanthidrol microchem. method shows that the epithelia of the convoluted tubules actively secrete urea, and that this is contained in remarkable quantities in the blood and interstitial tissue of the kidney. A small quantity of urea passes also through the glomerular filter.

H. G.

**A new optical instrument for the determination of hemoglobin.** H. S. NEWCOMER. *J. Biol. Chem.* 55, 569-74(1923).—Description of a modified Dubosq colorimeter in which the light transmitted through a soln. of acid hematin (prepd. by diln. of 10 or 20 cu. mm. of blood to 5020 cu. mm. with 1% HCl) is compared with that transmitted through a column of  $\text{H}_2\text{O}$  of the same height and a piece of standard glass. The pinion carrying the hematin soln. also carries a drum which is calibrated to give readings directly in % hemoglobin.

I. GREENWALD

**A method for the determination of dissolved carbon dioxide.** F. G. HALL. *J. Biol. Chem.* 55, 751-5(1923).—A modification of the app. of Van Slyke and of Van Slyke and Stadie (*C. A.* 11, 2208; 16, 728) adapted for use with large vols. of liquid. The app. is not shaken, but the gases are liberated by repeated evacuations (10). The total vol. of liberated gases is measured, the  $\text{CO}_2$  is absorbed in KOH soln. in the Hempel pipet and the vol. of the unabsorbed gas is again measured.

I. GREENWALD

**Test for adrenaline.** RUSSMANN. *Klin. Wochschr.* 1, 654(1922).—Four cc. of the faintly acid test soln. are treated with 1 drop of a cold satd. soln. of  $\text{HgCl}_2$ , 3 drops of a cold satd. soln. of sulfanilic acid and 1 cc. of an acid KI soln. In the presence of adrenaline the liquid becomes brown. A distinctly discernible color is still obtained with an adrenaline concn. of 1:50,000,000.

MILTON HANKE

**Estimation of choline in blood.** J. S. SHARPE. *Biochem. J.* 17, 41-2(1923).—**Principle.**—Ext. choline from blood or tissues and ppt. it with I as periodide, wash off any free I, decompose the periodide with dil.  $\text{HNO}_3$ , ext. the free I with  $\text{CHCl}_3$  and est. with standard  $\text{Na}_2\text{S}_2\text{O}_3$ . **Method.**—From 20 to 50 cc. of blood are drawn off into about 4 times this vol. of abs. alc. and well shaken. The mixt. is allowed to stand for 12 hrs. and then filtered into an evapg. dish. The ppt. is washed with abs. alc. and [the washings?] added to the filtrate. The latter is evapd. to a sirup and taken up with distd. water. The evapn. and extn. (with water) are repeated until the material is alc.-free. The soln. is transferred to a dialyzing thimble of about 15 cc. capacity and dialyzed for 24 hrs. in 200 cc. distd. water. The dialysis is repeated. The liquids are combined and evapd. to about 5 cc. 20-30 vols. of satd. I in KI are added, and the mixt. is allowed to stand overnight so that the choline periodide may crystallize. The ppt. is filtered on a Gooch crucible and washed with water until free from I. A mixt. of 2 parts  $\text{HNO}_3$  (1:1) and 1 part  $\text{CHCl}_3$  is added to the ppt. on the Gooch crucible. The I set free by the action of  $\text{HNO}_3$  on the periodide is taken up by the  $\text{CHCl}_3$  and carried into the flask by suction. The operation is repeated until the asbestos is quite white. The crucible is removed and more  $\text{CHCl}_3$  is added to the flask to ext. any I dissolved in the water. The  $\text{CHCl}_3$  layer is now washed acid-free by decantation with repeated quantities of water. The I in the  $\text{CHCl}_3$  layer is estd. by titration with 0.05 N  $\text{Na}_2\text{S}_2\text{O}_3$ . Recovery of from 90 to 94% was obtained when a known quantity of choline was added to blood and the method just outlined applied to det. the base. "The



possibility of lecithin breaking down is small if the process is carried out with reasonable speed. Tests performed on blood to which no choline was added gave negative results."

**Kidney function tests.** G. F. RAYNOR. *J. Am. Inst. Homeopathy* 15, 994-1001 (1923).—Review.

**Suggested adaptation to the gasometer method of the determination of the basal metabolic rate from carbon dioxide elimination.** C. A. MCKINLAY. *J. Lab. Clin. Med.* 7, 665-8 (1922).—Adaptation of the  $\text{CO}_2$  detn. of the basal metabolism to the Tissot spirometer is suggested. The total pulmonary ventilation is obtained with the volumetric detn. of the  $\text{CO}_2$ , which is not possible with the wt. method. Results obtained by this method in 26 cases checked well with those obtained by complete air analysis, except in cases of diabetes with a low respiratory quotient.

**The clinical value of basal metabolism determination.** R. J. PICKARD. *J. Lab. Clin. Med.* 7, 669-80 (1922).—"This paper briefly reviews the literature on the diagnostic value of the test, reports illustrative cases, with notes on the method of the test."

**A new type of recording spirometer.** R. BURTON-OPITZ. *J. Lab. Clin. Med.* 7, 681-7 (1922).—The essential part of this instrument is a cylinder which is placed horizontally and gives lodgement to a piston of hard rubber. The original must be consulted for details.

**Removable water-bath tops for paraffin embedding and low-temperature evaporation.** O. T. SCHULTZ. *J. Lab. Clin. Med.* 7, 689-90 (1922).—A removable top is made to fit the  $9 \times 4\frac{1}{2} \times 5$  in. water bath. This is made of sheet Cu and has 3 cylindrical sheet Cu depressions,  $2\frac{3}{4}$  in. deep by  $2\frac{1}{4}$  in. in diam., each of which holds a beaker of stock size. There are also 5 depressions  $1\frac{1}{4}$  in. deep by  $1\frac{1}{4}$  in. in diam., which take wide-mouthed vials or square-bottom test-tubes of standard size. A tubulature is provided for a thermometer. A removal ring top is adapted for evap. volatile fluids at low temp. It is made of sheet Cu and has 2 openings, 2 and  $2\frac{1}{2}$  in. in diam., one 4 in. and one 5 in. in diam. Each opening is fitted with a series of concentric rings by means of which the size may be adjusted as desired.

**The effect of bile salts in the urine on routine tests for albumin.** S. F. OLIVER. *J. Lab. Clin. Med.* 7, 743-5 (1922).—Practically all urines from cases of obstructive jaundice gave positive tests for albumin with the acetic acid and heat test, Heller's cold  $\text{HNO}_3$  test and Robert's reagent. In all cases where there was an increase in bile salts in the urine the latter was turbid if acid or became so if acid was added. After cholecystostomy the urines cleared up in 4 to 6 days. The substance pptd. in the routine albumin tests was not albumin, but bile salts.

**A convenient apparatus for simultaneous determination of total non-protein and urea nitrogen, and for prevention of bumping of filtrate during boiling.** J. W. MOORE AND LOUISE JONES. *J. Lab. Clin. Med.* 7, 756-7 (1922).—A modification of the Folin app. in which glass tubes with capillary points are inserted in the distn. tubes. A slow current of air is passed through them from an inflated rubber bag.

**A convenient form of test-tube rack.** STERNE MORSE. *J. Lab. Clin. Med.* 7, 753 (1922).—The tubes are supported in springs, so constructed that every part including the bottom of the tube can be thoroughly inspected without touching the tube.

**Technic of the measurement of basal metabolism.** HENRI STÉVENIN. *Bull. soc. hyg. aliment.* 10, 618-24 (1922).—S. has used a simple procedure for several yrs. for investigations into respiratory exchanges and has found it quite satisfactory though not as accurate as the Tissot app. For details the original should be consulted.

**True blood sugar values in normal and abnormal individuals.** WILHELM STEPP. *Arch. exp. Path. Pharmacol.* 90, 105-28 (1921).—Polarimetric and fermentation methods usually show a fair agreement and are the most reliable methods for blood sugar detn. Reduction methods are less accurate, since the presence of nitrogenous substances with reducing properties (uric acid, creatine, creatinine, amino acids, etc.) introduces an error, giving values too high by 20 to 40, or even 100%. Furthermore, diff. reduction methods give quite diff. values.

**Blood sugar studies. I. Critical survey of the methods for estimating blood sugar, and the threshold concept.** MAX ROSENBERG. *Arch. exp. Path. Pharmacol.* 92, 163-64 (1922).—The paper is preliminary to others on the same subject and is a criticism of the methods used. The threshold values given by diff. authors are considered and the conclusion is reached that no fixed amt. can be considered as representing a true threshold value.

**Chemical investigation concerning nuclear staining.** H. STREDEL and S. OSATO. *Z. physiol. Chem.* 124, 227-46 (1923).—In the staining of cell nuclei with basic dyes double decompn. reactions appear to occur between protein nucleates and the dye salts. Equil. occurs before the theoretical quantity of dye has been taken up.

R. L. STEHLE

**The tryptophan-aldehyde reaction.** ERNST KOMM and EBERHARD BÖHRINGER. *Z. physiol. Chem.* 124, 287-94 (1923).—The AcOH-tryptophan reaction is described which is adaptable for quant. work. Five cc. of tryptophan soln. or a protein soln. is treated with 5 cc. of 15% HCl contg. 6 cc. of 0.1% HCHO per 500 cc. Ten cc. of concd. H<sub>2</sub>SO<sub>4</sub> are added and the mixt. is shaken carefully until no bubbles of HCl appear. A blue violet color develops in the presence of tryptophan. One part of tryptophan in 75,000 gives a satisfactory result. To employ the test in a quant. way the protein is weighed in a colorimeter cup treated as described, and the color compared with that obtained with a known amt. of tryptophan. In general the accuracy is within 2-4% of the theoretical value. H<sub>2</sub>O<sub>2</sub> and H interfere with the reaction. The color does not fade within 24 hrs.

R. L. STEHLE

**Measurement of the alkalinity of blood.** CH. O. GUILLAUMIN. *J. pharm. chim.* 27, 5-23 (1923).—G. surveys the methods of detn. of  $p_H$  of blood plasma and detn. of the alk. reserve. Those of G. E. Cullen (*C. A.* 16, 2701) and of Van Slyke, Stillman and Cullen (*C. A.* 13, 2052) are adopted, with slight manipulative changes. In normal health,  $p_H = 7.40-7.45$  at 38°. The vols. of CO<sub>2</sub> calcd. from G.'s results were close to those detd. by Van Slyke and Stadie's gasometric method (*C. A.* 16, 728). The value of these detns. for diagnostic purposes and the errors due to defective methods of taking the sample are discussed.

S. WALDBOTT

**New specifications for starch intended for diastasic assays.** A. ASTRUC and A. RENAUD. *J. pharm. chim.* 27, 333-7 (1923).—A., E. Canals and R. recently noted (*Congress, French Assoc. Adv. Sci.*, Montpellier, 1922) that amylase of one and the same pancreatin, acting under identical conditions on potato starches of different com. quality, yielded amts. of maltose varying more than 20% in terms of amts. of starch hydrolyzed. The 2 principal causes are the variable compn. of the H<sub>2</sub>O used in the washing process, and the difference in size of the grains, as shown by the effects of sifting. The amts. of maltose increased with fineness of powder (using sieves of Nos. 100, 120, 140); in 2 samples the increase was from 46.6%, resp., 34.8% transformed starch before sifting, to 50.9%, resp., 56.0% after passing No. 140. The importance of a standard of uniform fineness for starches to be used in diastasic assays thus becomes evident; the use of a sieve No. 100 is recommended. Other factors, *e. g.*, humidity, light, etc., may affect the resistance of the starch grain; the temp. of drying has no influence. The starch used should have 7-8% H<sub>2</sub>O; to prep. the paste, 3 min. immersion in boiling H<sub>2</sub>O, with continuous shaking, is sufficient.

S. WALDBOTT

**Cremation and the legal recognition of poisons (LIPPICH) 7.** Estimation of As (LYNCH) 7. Action of H<sub>2</sub>O<sub>2</sub> on the decomposition of plant and animal substances (HRAUS) 7.

## C—BACTERIOLOGY

A. K. BALLS

**Dissociation of microbic species. II. Mutation in pure-line strains of the bacillus of rabbit septicemia.** P. H. DEKRUIF. *Proc. Soc. Exptl. Biol. Med.* 19, 34-7 (1921); cf. *C. A.* 16, 2346.—This bacillus appears as two distinctly different types. Type D is very virulent for rabbits, grows diffusely in liquid media, and yields highly fluorescent rather opaque colonies on serum agar. Type G is of extremely low virulence, exhibits a granular sedimentary growth in fluid media and translucent non-fluorescing colonies on serum agar; morphologically, fermentatively, and antigenically they are the same. Type D grown in undiluted rabbit serum incubated for 109 hrs. at 37° showed no mutation; grown in plain broth, Type G began to appear in 48 hrs. and constituted 10% of the total organisms in 109 hrs. Type G shows no tendency to revert to Type D even when returned to undiluted rabbit serum. Filtrates from D cultures are antagonistic to the mutation of D to G; peptones in suitable concn. greatly accelerate mutation.

**III. Differentiation of types D and G by acid agglutination.** *Ibid.* 37-8.—Suspensions in mixts. of Na lactate-lactic acid ( $p_H$  4.7 to 2.4) and of Na acetate-acetic acid ( $p_H$  5.6 to 3.2) were incubated at 43° for 16 hrs. The optimum acid agglutination for type G occurred between  $p_H$  4.7 and 4.0; for Type D it was quite const. between  $p_H$  3.5 and 3.0.

**IV. Factors influencing the acid agglutination optimum of types D and G.** *Ibid.* 38-40.—The optimum  $C_H^+$  for acid agglutination of types D and G is either shifted

or broadened by glycochol, peptone or beef infusion. V. Further considerations in regard to the virulence of microbes D and G. *Ibid* 40-3.—The virulence of type D remains const. so long as mutation to type G has not taken place. Animal passage of type G increases its virulence, raises the optimum  $C_H^+$  for acid agglutination but the non fluorescence and granular characters of growth persist. Intrapleural inoculation of type G is followed by intense phagocytosis; type D causes a slow aggregation of polymorphonuclear cells and phagocytosis is less marked. C. V. B.

The influence of the surface tension of the culture medium on bacterial growth. W. P. LARSON. *Proc. Soc. Exptl. Biol. Med.* 19, 62-3(1921).—Pellicle-forming bacteria will grow diffusely if the surface tension of the medium is lowered. Under these conditions *B. subtilis* and *B. anthracis* become *asporogenous*, the pneumococcus and streptococcus will not grow, but organisms which inhabit the intestinal tract grow abundantly. Organisms which grow well in low-tension media are the best antigens. C. V. B.

Investigations on the bacteriophage against staphylococci. S. M. KROPVELD. *Nederland. Tijdschr. Geneeskunde* 67I, 1228-31(1923).—The bacteriophage is cultivated from pus or feces on bouillon and filtered through a Berkefeld filter, according to the method of d'Herelle. R. BEUTNER

Microorganisms concerned in the oxidation of sulfur in the soil. III. Media used for the isolation of sulfur bacteria from the soil. S. A. WAKSMAN. *Soil Science* 13, 329-36(1922).—S bacteria may be classified on a physiological basis into sulfide, thio-sulfate and true S groups. They may also be classified on the basis of the optimum reaction for activity. Several media are suggested for the different groups. The organisms responsible for the oxidation of elemental S to  $H_2SO_4$  in the soil are characterized by an optimum activity in media with  $p_H$  3-4. RICHARD BRADFELD

Microorganisms concerned in the oxidation of sulfur in the soil. IV. A solid medium for the isolation and cultivation of *Thiobacillus thiooxidans*. S. A. WAKSMAN. *J. Bact.* 7, 605-8(1922); cf. preceding abstr.—The following medium was used.  $Na_2S_2O_8 \cdot 5H_2O$  5 g.,  $KH_2PO_4$  3 g.,  $NH_4Cl$  0.1 g.,  $MgCl_2$  0.1 g.,  $CaCl_2$  0.25 g., agar 20 g., distd. water 1000 cc. It was prepd. as usual and sterilized at 15 lbs. pressure for 15 min. V. Bacteria oxidizing sulfur under acid and alkaline conditions. *Ibid* 609-16.—At least two organisms can be shown to take part in the oxidation of S of the soil. In acid soils *Th. thiooxidans* will rapidly oxidize elementary S. In alk. soils, particularly black alk. soils, *Thiobacillus B.*, similar to *Th. thioparus* of Beijerinck, takes an active part in the process. *Th. thiooxidans* is usually not present in common cultivated soils, but is found abundantly in soils previously treated with S. In cultivated soils *Thiobacillus B.* is commonly present. By the interaction of the two organisms, S can oxidize at reactions ranging from  $p_H$  9.8 to 1.0. JOHN T. MYERS

Stimulating the growth of *Azotobacter* by aeration. O. W. HUNTER. *J. Agr. Research* 23, 665-77(1923).—*Azotobacter* cultures isolated from soil samples were grown on a medium consisting of tap  $H_2O$ ,  $K_2HPO_4$ ,  $MgSO_4$ , NaCl, and dextrose. Total N and sugar detns. were made at frequent intervals. The data show that a prompt and vigorous growth of *Azotobacter* can be induced in large quantities of a liquid medium by sufficient aeration. Aeration stimulates rapid N fixation by *Azotobacter*. A close relationship exists between the rates of dextrose fermentation and N fixation. The presence of  $CaCO_3$  is not essential in a medium used for the aeration of pure cultures of *Azotobacter*. F. C. COOK

Production of a growth-promoting substance by *Azotobacter*. O. W. HUNTER. *J. Agr. Research* 23, 825-31(1923).—Three white rats were fed a diet in which the  $H_2O$ -sol. vitamin was replaced by dried *Azotobacter* cells. The diet was composed of 58% starch, 20% casein, 10% lard, 5% butter, 3% ash, 2% agar and 2% *Azotobacter*. Rats fed the same diet without the *Azotobacter* failed to gain wt., developed sore eyes and soon died. The *Azotobacter* were grown on a medium composed of distd.  $H_2O$ ,  $KH_2PO_4$ ,  $MgSO_4$ , NaCl and dextrose. The dried *Azotobacter* was added to a diet deficient in  $H_2O$ -sol. vitamin which was fed to 3 white rats. Three other rats were fed a diet containing in place of the *Azotobacter*. The growth is shown by curves. The writer concludes that *Azotobacter* is capable of mfg. a growth-promoting substance if it is required for its development. The organism can synthesize a food accessory factor similar to  $H_2O$ -sol. B. This factor stimulated a greater net gain in white rats than bakers' yeast. *Azotobacter* exerts a pronounced curative effect upon pigeons affected with polyneuritis. F. C. COOK

Alcoholic fermentation in relation to vital activity of *Saccharomyces*. A. COSTANTINO. *Arch. sci. biol.* 3, 263-78(1922); *Physiol. Abstracts* 7, 462; cf. C. A. 16, 4224.—Energy exchanges in *Saccharomyces* are due to two processes: one manifests itself in the presence of free O and affects substances which have nothing in common

with sugars; the other is connected with the internal oxidation of glucose. The splitting of sugars is always due to a fermentation through zymases, with production of alc. and  $\text{CO}_2$ , independently of the presence or absence of  $\text{O}_2$ . H. G.

The alkalinity of nutrient media measured by the Michaelis indicator method, in its relation to the growth of bacteria. STICKDORN. *Z. Immunitäts I Abt., Orig.* 33, 576-80 (1922); *Expt. Sta. Record* 47, 502-3.—From a comparison of the methods of readjusting the reaction of culture media by titration with phenolphthalein or litmus, and by detg. the H-ion concn. colorimetrically with *m*-nitrophenol as an indicator, S. concludes that the latter method is to be preferred on account of its greater speed and accuracy. Bouillon, adjusted with NaOH following the addn. of common salt and Na phosphate, has proved more stable on subsequent sterilization than media neutralized with Na carbonate. Tests of the growth of 21 different bacteria in media of varying H-ion concn. have shown that a bouillon of H-ion concn. of  $p_H$  7.5 is most suitable for rapid growth. H. G.

The bios requirement of bakers' yeast. J. J. WILLAMAN AND A. G. OLSEN. *J. Biol. Chem.* 55, 815-36 (1923).—The literature is reviewed and it is concluded that bios is not identical with  $\text{H}_2\text{O}$ -sol. B vitamin, since it (bios) is more resistant to alkalis, is sol. in excess of phosphotungstic acid, is pptd. by  $\text{HgCl}_2$  and is not as readily adsorbed by fullers' earth as is vitamin B. W. and O. find that bios is readily removed from sucrose by crystn. of the latter from 80% EtOH but not by crystn. from 95% EtOH, which removes vitamin B.  $\text{NH}_4\text{Cl}$ , aspartic acid, alloxan, allantoin, biuret, caffeine, gelatin, guanine, guanidine, nucleic acid,  $p\text{-C}_6\text{H}_4\text{OHNO}_2$ , picramic acid, piperidine,  $\text{KNO}_3$ , theobromine, tyrosine, thymine, thiocarbamide, uracil, urea and uric acid were tested and found not to be bios. The substances used by other investigators, all with negative results, are also enumerated. I. GREENWALD

The Twort-d'Herelle phenomenon. A. G. NAST. *J. Am. Inst. Homeopathy* 15, 979-86 (1923).—Review. JOSEPH S. HEPBURN

Changes in nutrient agar due to clarifying with egg. LUTHER THOMPSON. *J. Lab. Clin. Med.* 7, 758-60 (1922).—An agar which is egg cleared is a special agar, because it contains S compds. derived from the egg, and is made alk. or acid according as egg white or egg yolk preponderates, and derives a fermentable substance, probably glucose, from the egg white. E. R. LONG

The identification of *Bacillus botulinus* and its toxin in culture and in canned foodstuffs by serological methods. R. A. KELSEY. *Am. J. Pub. Health* 13, 365-76 (1923).—Culture of *B. botulinus*, either in a pure or contaminated state, can be identified by means of complement-fixation titrations. The technic is given at length. NATHAN VAN PATTEN

The value of milk powder agar in the bacteriological laboratory. H. F. ZOLLER. *Am. J. Pub. Health* 13, 384-7 (1923).—Milk powder agar is recommended for use in bacteriological labs. on account of the ease with which it is prepd. in the modified way, the higher total counts obtained for all milk products as compared with standard agar, the fact that it permits of a valuable qual. detn. of each plate and aids in culture isolation by giving a characteristic property picture of the colony being fished. NATHAN VAN PATTEN

## D—BOTANY

B. M. DUGGAR

Water content of barley kernels during growth and maturation. H. V. HARLAN AND M. N. POPE. *J. Agr. Research* 23, 333-60 (1923); cf. *C. A.* 15, 1740; 16, 575. F. C. COOK

Hydrogen-ion concentration and varietal resistance of wheat to stem rust and other diseases. ANNIE M. HURD. *J. Agr. Research* 23, 373-86 (1923).—The H-ion concns. of several varieties of wheat were detd. electrometrically. Most of the plants were grown in the greenhouse but in some expts. germinator seedlings 3-4 in. high, grown without light, were used. No correlation was found between the H-ion concn. of the expressed juice and the resistance or susceptibility of wheat varieties to disease. Environmental factors produce differences in H-ion values. The  $p_H$  of the juice of wheat plants grown in the greenhouse averages 0.1 higher when plants are cut at 1 P. M. compared with others cut at 9 A. M. Plants grown on limed soil showed a lower H-ion concn. of juice than those from unlimed soil. Wheat plants showing an unhealthy appearance, also plants infected with *Erysiphe graminis*, showed a high acidity of the juice. The geographic source of the seed does not influence the H-ion concn. of the juice of the plants. The H-ion concn. in expressed wheat juice increases on standing. Dln. of the expressed juice decreases the H-ion concn.; the addn. of 2 vols. of  $\text{H}_2\text{O}$  to

1 of juice increases the  $p_H$  by 0.10 to 0.15. Young germinator seedlings are more highly buffered against diln. than older greenhouse plants.

**Iron and manganese content of certain species of seeds.** J. S. McHARGUE. *J. Agr. Research* 23, 395-9 (1923).—The av. % of Fe and of Mn, resp., of each of the following are: wheat 0.0039, 0.0047; spring oats 0.0050, 0.0049; garden peas 0.0096, 0.0012; garden beans 0.0103, 0.0018; soybeans 0.0074, 0.0028; clovers 0.0156, 0.0039; grasses 0.0107, 0.0111. The % of Fe and of Mn, resp., of 1 sample of each of the following are: sunflower 0.0034, 0.0033; hemp 0.0210, 0.0165; flax 0.0065, 0.0038; rape 0.0059, 0.0046; tobacco 0.0240, 0.0070.

**The gas in the coconut.** D. A. HERBERT. *Philippine Agr.* 11, 177-9 (1923).—Young nuts contain 2-3 cc. gas each and old nuts about 23 cc. The gas appears after the endosperm is well developed, and at first consists of N 81.3%, O 18.7% and CO<sub>2</sub> trace. As the age of the nut increases the total quantity of gas increases, but with progressive decrease in O<sub>2</sub>, this latter being consumed in the utilization of fat by the embryo. The compn. of gas from old nuts is N 99.8%, O 0.2%, and CO<sub>2</sub> trace.

**Influence of mineral matter on germination.** L. MAQUENNE and E. DEMOUSSEY. *Ann. sci. agron.* 38, 113-51 (1921); *Physiol. Abstracts* 7, 517.—Acids are harmful to germination in very small quantity. The favorable action of a no. of salts is recorded, e. g., Ca, Sr, and Mn. Mg and Al are less active, and above a certain amt. are toxic. K salts are without influence, although Na and NH<sub>4</sub> in certain amts. have a favorable influence. The action of a no. of other salts is also recorded. The expts. were conducted on winter peas.

**Chemical changes in yellow-striped sugar cane.** *Porto Rico Dept. Agr. and Labor Sta. Ann. Rept.* 1921, 18-9; *Expt. Sta. Record* 47, 842.—Investigations indicate that qual. tests of healthy and diseased sugar cane parts do not have value as diagnostic characters. Qual. tests of the photosynthetic activity of healthy and yellow-striped sugar cane, conducted by E. D. COLÓN, showed a decidedly inhibitory effect of yellow stripe on the photosynthetic activity of the plants as shown by the I test for starch.

**Effect of the salts of sodium and of potassium on germination.** H. MICHELIS. *Rec. institut bot. Léo Errera* 10, 161-7 (1922); *Physiol. Abstracts* 7, 517.—A comparison of the effect of Na and K, and of NO<sub>3</sub> and Cl, on the germination and growth of seedlings when used in equiv. very dil., completely dissociated solns. Cl appears to be more harmful than NO<sub>3</sub>, Na than K.

**Composition of corn pollen. II. Concerning certain lipoids, a hydrocarbon, and phytosterol occurring in the pollen of white flint corn.** R. J. ANDERSON. *J. Biol. Chem.* 55, 611-28 (1923).—There were isolated from the EtOH and Et<sub>2</sub>O exts. of corn pollen: (a) phytosterol palmitate, m. 88-88.5°, yielding on hydrolysis palmitic acid m. 62.5° and 2 phytosterol fractions m. at 122° and 136.5°, resp.; the acetate of the latter m. 101°; (b) a satd. hydrocarbon, m. 136°, apparently *n*-nonacosane, C<sub>29</sub>H<sub>58</sub>; (c) a satd. alc., C<sub>30</sub>H<sub>62</sub>O, m. 136°; (d) a phosphatide contg. 4.09% P. The EtOH ext. contained 25% unsaponifiable matter consisting of a mixt. of phytosterols m. 121-54°. The acetate of the high-melting phytosterol m. 134°. The subsequent Et<sub>2</sub>O ext. contained 14% of the satd. hydrocarbon and 4.4% of phytosterol m. 125-6°. All the phytosterols isolated were free from H<sub>2</sub>O, were optically inactive and gave acetates of different m. ps. from that of ordinary phytosterol.

**Microchemical study of the garlic bulb.** M. BRABCKE. *Acad. roy. Belge., Classe Sci., Mem.* 121 6, No. 6, 1-36 (1921).—The following compds. were found in the garlic bulb: (1) glucoside contg. S and a double bond; it yields fructose and the essential oil of garlic on hydrolysis, and occurs in the cells of the parenchyma; (2) an enzyme which occurs in the albuminoid cells of the phloem and ligneous sheath, and produces the hydrolysis of the glucoside; (3) inulin; (4) starch which occurs in the sheath of the vascular system and in the roots.

**Microchemical study of coumarin.** A. NAVEZ. *Bull. sci. acad. roy. Belgique* 1922, 159-73; *Physiol. Abstracts* 7, 379 (1922).—Coumarigenin, a glucoside which cleaves into coumarin hydrocoumarate and *d*-glucose, occurs in the honey locust (*Melilotus albus* and *M. albusimus*); it is accompanied by tannin.

**Cytozyme extracted from the seed of Canavalia ensiformis.** J. B. SUMNER. *Compt. rend. soc. belge biol.* 1922, 26-9; *Physiol. Abstracts* 7, 379 (1922).—Successive treatment of the seeds with petroleum ether, acetone, toluene, and 95% alc. exts. a mixt. of phosphatides that possesses physiol. properties similar to those of cytozyme which participates in the normal coagulation of the blood.

JOSEPH S. HEPBURN

The photosynthesis of plant products. I. M. HENLEBRON. *Nature* 111, 502-4 (1923).—*Cf.* C. A. 16, 1969. A. P. LOCKE

The biological study of the ripening of the kakifruit. II. SHIGERU KOMATSU AND HIROKOSUKE UEDA. *J. Biochem. (Japan)* 2, 291-300(1923); *cf.* C. A. 17, 1982.—The reducing sugar content increases during ripening; this is probably accomplished at the expense of either cane sugar or pectin, because the ratio between the fructose and glucose fraction remains almost const. The amt. of pectin decreases continuously and the cane sugar content reaches a max. early in Nov. Although pentosans show a const. increase, the amt. of hexosans decreases. The sol.-tannin content decreases but there is no evidence that it becomes insol. by combining with pectin or other substance. The pectin isolated from mature fruit is brown. Also the cellulose prep'd. from the mature fruit contains a dark brown comp'd., and this colored substance is thought to originate from the tannin. Most of this brown coloring matter was present in alk. or acid exts. from the pulp residue insol. in hot water, which is free from N. This lead to the conclusion that the tannin is phlobatannin. III. Chemical composition of the cured fruit. S. KOMATSU, H. UEDA AND MOTARO ISHIMASA. *Ibid* 301-8.—To remove the unpleasant acid taste from astringent fruit 2 methods are practiced in Japan: (1) The full-grown fruit is peeled and kept out-of-doors for a few weeks; (2) the whole fruit is submerged for a few days in warm water or alc. vapor. The cured fruit prep'd. by either method contains sucrose, *d*-glucose, *d*-fructose, pectin and tannin. The white powder which is found deposited on the dry fruit consists of only glucose and fructose. The glucose/fructose ratio in this powder is 90/10, while that in the pulp of the desiccated fruit is 54/46. S. MORGULIS

Latexes of some commoner Euphorbiaceae in Sardinia (*Dendroides* L., *Characcias* L. and *Pinea* L.) and the toxic qualities of the milk of animals feeding upon these plants. RINALDO BINAGHI. *Giorn. chim. ind. applicata* 4, 260-4(1922).—The latexes of these plants are used by the shepherds as an energetic purgative (1 drop much dild.) or as an emetic (in larger doses). The following data were obtained for the latexes from *Dendroides*, *Characcias* and *Pinea*, resp., sp. gr., 1.2630, 1.2050, 1.2216; H<sub>2</sub>O, 73.25, 78.02, 75.13; resin-gums, 26.75, 21.98, 24.87; ash, 4.53, 5.77, 7.10. The latexes contain, as others found previously, an active principle euphorbium, isolated by treatment with Cl as an elastic sticky substance presenting the principal characteristics of com. rubber. Poisoning from milk of sheep or goats which have fed upon these plants is attributed to the presence of euphorbium in the milk. ROBERT S. POSMONTIER

The nature and reaction of water from hydathodes. J. K. WILSON. Cornell Agr. Expt. Sta., *Mem.* 65, 10(1923).—Total solids in the H<sub>2</sub>O exuded through the hydathodes from maize plants growing under non-sterile conditions were as high as 1030 p.p.m. The total solids in H<sub>2</sub>O from timothy plants which were growing in closed containers in the presence of microorganisms were much less, being in one case only 573 p.p.m. and in another only 220 p.p.m. In all cases the total solids were more than half org. matter. Reactions were obtained which indicated the presence of NO<sub>2</sub>, NO<sub>3</sub>, materials capable of reducing methylene blue, catalases, and peroxidases, in the exuded H<sub>2</sub>O from maize, oats, and timothy. Reductases were probably present in the H<sub>2</sub>O from timothy, but no reaction was observed to indicate their presence in the H<sub>2</sub>O from maize. The exuded H<sub>2</sub>O from various plants was a good medium for the growth of bacteria, which was evidenced by an increase in the no. of bacteria in inoculated H<sub>2</sub>O. The H-ion concn. of H<sub>2</sub>O from hydathodes of maize, oats, and timothy is nearly neutral when the H<sub>2</sub>O is exuded by young plants. The acidity increases as the plants became older, until a max. is obtained. J. J. SKINNER

Recognition of active protein. TH. BOKORNY. *Z. allgem. Physiol.* 20, 74-84 (1922).—A list of plant species is presented with the results of tests for active albumin (proteosoma). G. H. S.

Distribution of Fe in fibers, etc. (RICHTER) 25. Quantitative determination of amino acids of seeds. II. (HAMILTON, *et al.*) 12.

## E—NUTRITION

PHILIP B. HAWK

### NORMAL

The influence of the composition of the food on the calcium output. B. SJOLLEMA. *Proc. Acad. Sci. Amsterdam* 25, 395-8(1923).—A continuation of an earlier study [*cf.* C. A. 17, 1493]. An increase in the indigestible substances fed to rabbits augmented the loss of Ca by way of the intestine. The Ca in the feces is not produced entirely

from the ingested Ca but some may have metabolic origin and therefore it is suggested that Ca may play a role in the production of feces. Care should be taken with animals yielding a large amt. of milk to avoid a large amt. of ballast in the food as this increases the danger of a negative Ca balance. P excretion in the feces was diminished in the periods when indigestible ballast was added to the food.

**Dried milk powder in infant feeding.** T. CLARK AND S. D. COLLINS. U. S. Pub. Health Service, *Publ. Health Repts.* 37, No. 40, 2415-33 (1922).—The results of this more extended study tend to confirm the conclusions in the preliminary report, (*C. A.* 15, 110) which were based on observations extending over a period of relatively short duration, that the dried milk powders and their remade products used in this study are safe for infant feeding, and in some cases seem to have distinct therapeutic value.

**The influence of radiant energy upon the development of xerophthalmia in rats; a remarkable demonstration of the beneficial influence of sunlight and out-of-door air upon the organism.** G. F. POWERS, E. A. PARK AND NINA SIMMONDS. *J. Biol. Chem.* 55, 575-97 (1923).—Rats fed a diet known to produce xerophthalmia under ordinary lab. conditions were kept (a) in the dark; (b) under ordinary lab. conditions; (c) as (b), but with about 4 hrs. daily exposure to sunlight and out-of-door air; (d) as (b), but with about 30 min. daily exposure to Hg-vapor light. The only protection against xerophthalmia was obtained with sunlight and that was not complete.

**A note on the effect of some organic acids upon the uric acid excretion of man.** H. V. GIBSON AND E. A. DOISY. *J. Biol. Chem.* 55, 605-10 (1923).—The ingestion of Na lactate caused a decrease and of Na pyruvate an increase in the excretion of uric acid. Na lactate seemed to produce a slight increase (0.3 mg. per 100 cc.) in the concn. of uric acid in the plasma and markedly diminished the uric acid excretion after the ingestion of cottage cheese or thymus. Cf. *C. A.* 12, 2607.

**The utilization of carbohydrate by rats deprived of vitamin B.** H. A. MATTILL. *J. Biol. Chem.* 55, 717-27 (1923).—The literature on the effect of vitamin deprivation on carbohydrate and energy metabolism is reviewed. In M.'s expts., feeding cane sugar or glucose was followed by a slightly less rapid rise in the value of the respiratory quotient in rats deprived of vitamin B than in normal rats. The difference is believed to be due to difference in rate of absorption. Basal quotients were alike in both groups; non-fasting quotients were slightly lower in the vitamin-deprived animals, thus reflecting their semi-fasting condition. A simple app., consisting of a bell-jar, with stopper carrying manometer, thermometer and connection for sampling tube, is described. By using the Haldane app. for gas analysis, respiratory quotients can be detd. on small animals in 20 to 40 minutes.

**A possible factor influencing the assimilation of calcium.** C. H. HUNT, A. R. WINTER AND R. C. MILLER. *J. Biol. Chem.* 55, 739-42 (1923).—The Ca balance in 2 milking goats was favorably influenced by feeding  $\text{Ca}_3(\text{PO}_4)_2$  pptd. in a starch paste. This influence may be due to the fineness of division of the  $\text{Ca}_3(\text{PO}_4)_2$  since no such effect was obtained with other Ca addns. (Cf. Forbes, *et al.*, *C. A.* 11, 623, 2098; 13, 1335; 16, 2352 and Hart, *et al.*, *C. A.* 16, 3504 and results to be published). Possibly the difference in green or dry hay in causing a difference in the assimilation of Ca is partly due to a difference in the phys. properties of the cell content of the 2 hays and a consequent difference in digestibility.

**Sugar elimination after the subcutaneous injection of glucose in the dog.** Including a discussion of the paper on observations on carbohydrates by Folin and Berglund. S. R. BENEDICT AND EMIL OSTERBERG. *J. Biol. Chem.* 55, 769-94 (1923).—The subcutaneous injection of glucose in a dog weighing 14.6 kg., immediately after the ingestion of the daily ration of 200 g. cracker meal, 40 g. meat, 90 g. evapd. milk and 50 g. bone ash, was followed by an increase in the rate of excretion of fermentable, of nonfermentable and of hydrolyzable sugar, even when as little as 0.4 g. per kg. body wt. was used. Similar results were obtained with another dog fed in the same manner but no such increases were observed in a few expts. upon a fasting dog. The sugar is believed to consist of glucose (possibly a form not directly utilizable by the body) and of condensation products (intermediates between glucose and glycogen or fat). The work of Folin and Berglund (*C. A.* 16, 2172) is criticized. It is claimed that increases of 20% and more, that are of real significance, have been disregarded. The use of 200 g. of glucose is regarded as improper, for it is claimed that such quantities may, possibly, impair the efficiency of the kidney. (References to the literature are given.) The use of but one subject in most of the expts. is unfortunate, since his metabolism may not be of the usual type. That less sugar was excreted in the urine after the ingestion of a mixt. of equal parts of glucose and galactose than after the same amt. of galactose

alone is believed by B. and O. to be due to delayed absorption due to the larger amt. of sugar and larger amt. of  $H_2O$  ingested. B. and O. emphasize the fact that they always recognized that most of the urinary sugar was not glucose but they reassert their belief that approx. 25% is glucose or substance derived therefrom and that the work of F. and B., properly interpreted, corroborates them. I. GREENWALD

**Bile and purine metabolism.** KARL HARPUEDER. *Klin. Wochschr.* 2, 436-8(1923).—Contrary to the statement of Brugsch and Rother (*C. A.* 17, 306), it is not always possible to isolate uric acid from bile. Uric acid can always be demonstrated in bile colorimetrically; but the quantities are small and could be of no significance for either the endogenous or exogenous metabolism of that substance, especially since the ingestion of purines does not lead to an appreciable increase in the uric acid content of the bile. MILTON HANKE

**Vitamins.** F. B. GUTHRIE. *Agr. Gaz. N. S. Wales* 34, I, 53-7(1923).—A discussion, with special reference to the vitamin content of stockfeeds and their relation to growth. WM. HAZEN

**Diet in relation to teeth.** A. C. JONES. *Dental Cosmos* 65, 519-27(1923).—The relationship between the chem. compn. of the diet and susceptibility to dental caries is discussed. JOSEPH S. HEPBURN

**Energy expenditure and food requirements of children at school.** E. M. BEDALE. *Proc. Roy. Soc. London* 94B, 368-404(1923).—"From the age of 8, the daily food requirement of boys and girls is not less than 2500 available cal. From 12 to adult life for girls, and from 12 to about 16 for boys, a flat rate of 3000 cal. would be a satisfactory scale for schools to adopt. Boys from about 16 yrs., if big and athletic, require about 4000 cal. per diem." JOSEPH S. HEPBURN

**Nutrition on high-protein dietaries.** J. C. DRUMMOND, G. P. CROWDEN AND E. L. G. HILL. *J. Physiol.* 56, 413-20(1922).—White rats fed a ration contg. 83% casein + 5% yeast ext. + 5% lemon juice + 2% shark-liver oil + 5% salt mixt. grew at a subnormal rate, and did not breed. Apparently they were in good health as indicated by their coats, appetites and behavior. The wts. and microscopic appearance of the internal organs were normal. Plenty of body fat was present but there was marked beading of the ribs. In some cases there was a markedly objectionable odor to the contents of the abdominal cavity of the freshly killed animals, suggesting an excessive intestinal putrefaction. Nutrition failure was not due to an inadequate calorie intake nor, probably, to a deficiency in vitamins. Kittens fed raw lean beef + yeast ext. + shark-liver oil + salt mixt. grew at a subnormal rate and showed symptoms of lameness that seemed to disappear when the shark-liver oil was increased but no increase of the growth rate followed. On autopsy a cat from the high-protein group showed a marked beading of the ribs but no abnormality of the tissues on microscopic exam. J. F. LYMAN

**Vitamins and the routine of food supply.** J. CHEVALIER. *Bull. sci. pharmacol.* 30, 136-43(1923).—A general review. L. W. RIGGS

**Energy exchange and surface area.** M. PFAUNDLER. *Arch. ges. Physiol.* (Pfüger's) 188, 273-80(1921).—A purely mathematical treatment of the relations between metabolism and surface area. If surface is to be considered the total surface of assimilation must be taken into account, that is, the sum of the surfaces of all the cells and elements which take part in the metabolic activity. G. H. S.

#### ABNORMAL

**B-vitamin and pigeon beriberi.** S. WRIGHT. *Lancet* 1922, I, 297; *Expt. Sta. Record* 47, 168.—In reply to de Wyss, *C. A.* 17, 1059, W. points out that the intestinal phenomena mentioned in the report of his investigation can be noted when the animal appears to be otherwise in perfect health, and cannot, therefore, be regarded as part of a general depression of the tissues throughout the body. The diminution in the oxidative powers of the tissues of animals in an advanced stage of beriberi is considered a secondary phenomenon. H. G.

**B vitamin and pigeon beriberi.** W. R. HESS. *Lancet* 1922, I, 554; *Expt. Sta. Record* 47, 862.—In reply to Wright (preceding abstr.). The symptoms of B-vitamin deficiency consist in a depression of the energetic processes of the body as shown by the subnormal temp. and muscular weakness in the early stage and the well known signs of cerebral irritation and paralysis in advanced period. It is to these symptoms in the first instance that apply the conclusions that they are due to loss of oxidative power of the tissues, the insufficiency of the alimentary canal being only a part of the general insufficiency of all tissues. The oxidative process of the cell takes place in a series of different stages. There are two main phases of the whole chain of events. The first



is given by the reduction of the carbohydrates to lactic acid and the second by the oxidative removal of the formed lactic acid. The disturbance of the chem. reactions in B-vitamin deficiency aims at the second phase. The reduction of the oxidative power of the tissues in the vitamin-deficient animal is a fact which can be demonstrated *in vitro*. The production of all the main symptoms of beriberi by sublethal doses of prussic acid shows that the reduction of the oxidative power is the cause of the malady and not secondary effect. HCN inhibits the action of the oxidative enzymes.

H. G.

**Further observations on the use of a high-fat diet in the treatment of diabetes mellitus.** L. H. NEWBURN AND P. L. MARSH. *Arch. Intern. Med.* 31, 455-90(1923); cf. *C. A.* 15, 551, 2669.—"A low-protein, low-carbohydrate, high-fat diet, fed a large group of diabetic patients since March 1, 1918, produced and maintained an aglycosuric state, was not attended by acidosis and caused its disappearance when present (short of coma) at the beginning of treatment, maintained N balance, did not cause a hyperlipoidemia and was attended by its disappearance in those patients in whom it was present at entrance, supplied sufficient energy (a) to avoid the evils of fasting and undernutrition and (b) permit an amt. of activity compatible with earning a livelihood and was, within the limits of our observations, not attended by downward progress in uncomplicated cases." The ketogenic-antiketogenic ratio calcd. according to the methods of Shaffer (*C. A.* 15, 3307; 16, 741) or of Woodyatt (*C. A.* 16, 2167) could be as high as 4:1 without the appearance of ketone bodies in the urine. I. GREENWALD

**The mechanism of phlorhizin diabetes.** T. P. NASH, JR. AND S. R. BENEDICT. *J. Biol. Chem.* 55, 757-67(1923).—"Dextrose ingested in sufficient amt. to induce protracted hyperglucemia in phlorhizinized dogs is recovered quantitatively in the urine. It is suggested that phlorhizin not only affects the permeability of the kidney tissue to blood sugar, but produces an intrinsic impairment of the sugar-burning mechanism. When a mixt. of dextrose and urea is ingested by a phlorhizinized dog, the sugar is excreted in the urine more rapidly than the urea. The phenomenon is similar to that observed when meat or proteins are fed to phlorhizinized dogs, and discredits the interpretation of a more rapid production of sugar than urea in amino-acid metabolism."

I. GREENWALD

**Avitaminosis in fish.** WILHELM LAUFBERGER. *Arch. ges. Physiol. (Pflüger's)* 198, 31-6(1923).—Fish (*Amyrus vulgaris*) were subjected to diets deficient in vitamins. During the period of the expt. the control group, receiving vitamins A, B, and C, gained 19% (av.) in wt. Those that received no vitamins lost 4% (av.) or died prior to the termination of the test period. Those receiving A and B gained 17%; those receiving B only gained 13%.

G. H. S.

**Organic foodstuffs with specific action. XXIII. Effect of a scorbutic diet upon normal and thyroidectomized guinea pigs.** EMIL ABDERHALDEN. *Arch. ges. Physiol. (Pflüger's)* 198, 164-8(1923); cf. *C. A.* 17, 1824.—Normal and thyroidectomized guinea pigs were fed exclusively upon extd. barley. The thyroidectomized pigs usually showed symptoms of scurvy earlier than did the normal pigs, and the disturbance was always more severe in the thyroid-free animals. XXIV. **Cell respiration and alimentary dystrophy in pigeons after polished rice feeding.** EMIL ABDERHALDEN AND ERNST WERTHEIMER. *Ibid* 169-78(1923).—In pigeons upon a polished rice diet there is a diminished body temp., a reduction in the total gas metabolism and decreased cellular respiration. These changes go in parallel and are all influenced by the same factors. Dystrophic pigeons show a diminished cysteine content of the organs. Studies of the N, C, and S relationships indicate that the low cysteine is not the result of inadequate cysteine. The muscle tissue of rice-fed pigeons transforms cysteine to cystine in but minimal amts., if at all, while corresponding tissues of normally fed animals show active reduction. If yeast is added to the tissue of the rice-fed pigeon reduction takes place. In HCN intoxication the oxidation processes are disturbed while the reduction processes are either unchanged or increased. XXV. **Effect of bromobenzene upon normally fed and rice-fed pigeons.** EMIL ABDERHALDEN. *Ibid* 179-90.— $C_6H_5Br$  was injected intramuscularly into normally fed and rice-fed pigeons. Normal birds showed but slight effects: gastric disturbance and some fall in temp. The rice-fed animals were profoundly affected. The  $CO_2$  elimination increases after the injection, then falls with the derangement of cellular respiration.

G. H. S.

**Alimentary anemia.** ALEX. BRINCHMANN. *Z. Kinderheilk.* 30, 158-94(1921).—When young guinea pigs are fed upon diets deficient in Fe an anemia results. The anemia is of the so-called chlorotic type, and the condition can be prevented or removed by the addn. of Fe to the diet. It is emphasized that these findings cannot be applied directly to other animal species.

G. H. S.

## F—PHYSIOLOGY

ANDREW HUNTER

The calcium content of the blood of thyroidectomized animals. MARIE PARRON. *Endocrinology* 7, 311-2(1923).—The blood of thyroidectomized sheep contained a smaller amt. of Ca than normal, supporting the idea that one of the most important functions of the thyroid is the regulation of Ca metabolism. HARRY J. DEUEL, JR.

Studies on the detoxification of cyanides in health and disease. MEYER BODANSKY AND MOISE D. LEVY. *Arch. Intern. Med.* 31, 373-89(1923).—The excretion of CNS in the saliva of 8 normal persons and 17 hospital patients was observed before and after the ingestion of 10 mg. KCN or 10 mg. KCNS. The patients excreted less CNS than did the normal persons but the increases after KCN and KCNS were somewhat greater. Both substances produced similar effects but these varied considerably in different individuals. The administration of cystine produced little effect on the excretion of CNS. Such effect as was obtained was observed in the patients, particularly when the cystine was given before the KCN. "It appears from our results that in certain disease conditions, such as pellagra, the cyanide detoxifying power remains unimpaired, provided the supply of cystine is adequate. I. GREENWALD

Studies on the carbon dioxide absorption curve of human blood. I. The apparent variations of  $p_{K1}$  in the Henderson-Hasselbalch equation. J. P. PETERS, H. A. BULGER AND ANNA J. EISENMAN. *J. Biol. Chem.* 55, 687-707(1923).—The  $CO_2$  content of blood and plasma and the  $O_2$  capacity and cell vol. of blood exposed to known mixts. of air and  $CO_2$  were detd. in 57 specimens. The value of  $p_{K1}$  calcd. from the Henderson-Hasselbalch equation varied with the cell vol. and the  $p_H$  but the correction factors proposed by Warburg (*C. A.* 17, 2872) were unsatisfactory. Others were devised. From Bohr's data (*Skand. Archiv. Physiol* 17, 104(1905)), the soly. of  $CO_2$  in any given mixt. of cells and plasma was calcd. as  $= (0.7118 - 0.1205 c) p_{CO_2}$ , in which  $c$  = relative vol. of cells and  $p_{CO_2}$  = mm.  $CO_2$  tension. The value of  $\log BHCO_3 - \log (H_2CO_3)$  was calcd. This was added to 6.1, which was assumed to be the value of  $p_K$  for plasma, to give what was called the uncorrected  $p_H$ . This differed from the  $p_H$  similarly calcd. for the plasma by an amt. which seemed to vary with the uncorrected  $p_H$  and the cell vol. A chart was constructed by which this correction,  $\Delta p_K$ , might be detd. The values obtained from the chart differed from those observed by  $\pm 0.02$ , av.  $\pm 0.007$ , with a definite tendency for the chart to give too low values with small cell vols. II. The nature of the curve representing the relation of  $p_H$  to  $BHCO_3$ . J. P. PETERS, ANNA J. EISENMAN AND H. A. BULGER. *Ibid* 709-15.—A series of 26  $CO_2$ -absorption curves between the limits of 20 and 80 mm. were detd. from the blood of 26 normal and pathol. subjects. The bloods studied varied in  $O_2$  capacity from 2.65 to 21.6 vols. % and in  $p_H$  (at 40 mm.) from 7.117 to 7.376. From the data thus obtained values for  $p_H$  were calcd. by means of the Henderson-Hasselbalch equation with the correction factors presented above. When these  $p_H$  values were plotted against  $(BHCO_3)$  the resulting curves were found to deviate from the straight line form assumed by Van Slyke, Austin and Cullen and by Warburg (*C. A.* 16, 2872). The av. deviation of the 40 mm. point from the straight line between the 20 and 80 mm. points was  $\pm 1.26$  vols. %, which is believed to be considerably greater than the exptl. errors in the methods employed. The av. change in  $p_H$  between 20 and 80 mm. was 0.206. The curve obtained by plotting the  $CO_2$  content against  $CO_2$  tension expressed in logarithmic form approximated a straight line better than did the  $p_H$ :  $(BHCO_3)$  curve, the av. deviation of the 40 mm. point being only 0.70 vol. %. I. GREENWALD

The rate of urea excretion. VII. The effect of various other factors than blood urea concentration on the rate of urea excretion. T. ADDIS AND D. R. DRURY. *J. Biol. Chem.* 55, 629-38(1923); cf. Drury, *C. A.* 17, 1661.—The rate of urea excretion (ratio of urea in 1 hr. urine to urea in 100 cc. blood) is increased by the ingestion of a mixed meal, milk, caffeine or glutamic acid, and is decreased by exercise or by the subcutaneous administration of pituitrin or adrenaline. These changes are independent of changes in the concn. of urea in the blood. The ingestion of 50 g. cane-sugar or of 100 cc. whiskey did not affect the rate of urea excretion. VIII. The effect of changes in urine volume on the rate of urea excretion. *Ibid* 639-51.—When the conditions were changed so as to vary the vol. of urine excreted in 1 hr. from 33 to 840 cc., the ratio of urea in that urine to urea in 100 cc. blood varied from a mean of 39.9 with small vols. to a mean of 46.5 with large vols. I. GREENWALD

Disturbed formation of adrenaline in the adrenals due to external causes, and its biological significance. BRUNO PRISER. *Klin. Wochschr.* 1, 628-9(1922).—The

adrenaline content of the adrenals from 158 persons who had been undernourished and who had in other ways suffered because of the post-war conditions showed a value only  $\frac{1}{4}$  as great as that obtained during the pre-war period. Personal changes in resistance, energy and endurance may be occasioned by changes in the endocrine organs which in turn may be brought about by external factors such as undernourishment. M. H.

**The distribution of acid in the cell.** K. SPRO. *Klin. Wochschr.* 1, 1199-200 (1922).—Ten cc. of a satd. aq. soln. of phenol were treated with 2 cc. of 85% phenol and 0.5 to 1.0 cc. of 0.10 N NaOH. The mixt. was thoroughly agitated and then allowed to sep. into 2 layers. The lower phenol layer, after proper diln. with water to give a clear soln., had a  $p_H$  of 6.75. The supernatant satd. soln. of phenol had a  $p_H$  of 7.9. The alkali was unequally distributed between the 2 layers; most of it passed into the upper water-rich layer. Similar results were obtained when  $NH_3$  was used in place of NaOH. The normal body cell has a heterogeneous structure. The concn. of  $H_2O$  and other constituents in different parts of the cell are not identical. It is safe to postulate, therefore, that the H-ion concn. of the cell parts is also not identical.

MILTON HANKE

**Lipoid content of the adrenal cortex of the guinea pig in experimental scurvy.** HERBERT PEIPER. *Klin. Wochschr.* 1, 1263-4 (1922).—Guinea pigs were fed exclusively on oats until they died of scurvy (6-8 wks.). The adrenals were removed, fixed and stained with Sudan III. The adrenal cortex was found to be very deficient in lipoid. The lipoid that was present appeared in small patches and showed signs of decrepitation. Guinea pigs that were at the point of death from scurvy were revived by feeding a normal diet. After 14 days, the perfectly recovered animals were killed and the adrenal cortex was again examd. The outer layers of cortical cells were found to be satd. with lipoid. From this layer of high lipoid concn., finger like projections of lipoid extended down toward the interior cells. The change of diet led first to a deposition of lipoid in the outer cortical cells. The interior cells were supplied only after the outer cells had been satd.

MILTON HANKE

**Calcium content of the blood during pregnancy.** S. T. WIDDOWS. *Biochem. J.* 17, 34-40 (1923).—There is a tendency to a decrease of Ca content of the blood toward the last months of pregnancy and a general tendency to rise directly after confinement. In the later stages of pregnancy "attention should be paid to the diet of the mother from the point of view of its Ca content. During the last 2 months of pregnancy milk (on account of its high percentage of Ca) should be given the mother in larger amt. than that included in the av. adult diet."

BENJAMIN HARROW

**Inorganic phosphorus content of the blood of normal children.** G. H. ANDERSON. *Biochem. J.* 17, 43-48 (1923).—Bell and Doisey's method (*C. A.* 14, 3685) was used. Whole blood is most suitable for estg. inorg. P. The av. normal P content of the blood in children (from 3 months to 13 years) is 4.9 mg. per 100 cc. The range is from 4.0 to 6.6 "and no figure between these two extremes can be regarded as abnormal." The amt. of inorg. P in the blood is uninfluenced by fasting for 24 hrs. and by the recent injection of a quantity of food rich in P.

BENJAMIN HARROW

**The physiology of the blood vessels and of their smooth muscular coat. IV. Action of the respiratory gases upon the rhythmic movements of the vessels.** A. RONCATO AND L. OSELLADORE. *Arch. fisiol.* 20, 17-32 (1922); *Physiol. Abstracts* 7, 413.—Rhythmic movements appear and persist in isolated blood vessels only in the presence of  $O_2$ , which also increases the tonus. The tonus decreases and rhythmic movements cease when the supply of  $O_2$  is withheld, or is replaced by  $CO_2$ , although very small doses of  $CO_2$  may function as excitants.  $CO_2$  exerts its action by producing an increase in the H-ion concn. in the pericardial lymph in which the preps. are kept.

JOSEPH S. HEPBURN

**Alterations in the diameter of erythrocytes during hemolysis.** ERIC PONDER. *Proc. Roy. Soc. London* 94B, 102-8 (1922).—The changes which occur in the diam. of the erythrocytes during hemolysis by hypotonic saline solns. are those which might be anticipated if the erythrocyte be considered as an ellipsoid with an elastic wall and fluid contents subjected to pressure by the entrance of fluid by osmosis. Saponin and Na taurocholate act by producing a decrease in surface tension and by attacking the cell membrane; saponin is the more powerful in respect to attacking this membrane. A hemolysin plus complement weakens the cell membrane by chem. action without any observable change in surface tension or osmosis.

JOSEPH S. HEPBURN

**Estimation of calcium in human cerebrospinal fluid.** HANS LEICHER. *Deut. Arch. klin. Med.* 141, 196-203 (1922).—The Ca is detd. by pptn. in alk. soln. with  $(NH_4)_2C_2O_4$  from 4 cc. of cerebrospinal fluid. The pptd.  $CaC_2O_4$  is titrated with  $KMnO_4$ . Fluids from cases with a normal pressure and normal amts. of Ca in the serum show a

marked constancy in Ca content which ranges from 4.7 to 5.4 mg. %. This is slightly less than  $\frac{1}{2}$  the amt. of Ca in the serum. The Ca in cerebrospinal fluid shows no relation to the pressure or to the Ca content of the serum. This indicates that *cerebrospinal fluid is neither a transudate or dialysate, but is a secretion.* JULIAN H. LEWIS

**Renal function as judged by the excretion of vital dyestuffs.** J. DE HAAN. *J. Physiol.* 56, 444-50 (1922).—The following dyes, fluorescein-K, phenol red, indigo carmine, 1,4 carmine, trypan blue and trypan red, were injected intraperitoneally into rabbits. Subsequently the concn. of the dye was detd. in (1) blood plasma, (2) ultrafiltrate of blood plasma and (3) urine. For comparison the urea concn. in the blood and urine was also detd. Assuming, as seems probable, that dyes are eliminated in a dil. form by the glomerulus according to physico-chem. laws and since by far the greater part of acid vital dyes is adsorbed to the colloids of the blood plasma, the results show that the primary glomerular filtrate cannot be free from protein. Reabsorption of the protein in the tubules must be accomplished by (enzymatic) decompn. of the protein-dye product, the dye being set free and the protein part reabsorbed. J. F. LYMAN

**Chlorine, sulfur and phosphorus content of the blood and tissues of starved animals.** KIKO GOTO. *Tohoku J. Exptl. Med.* 3, 195-205 (1922); cf. *C. A.* 16, 4277.—The blood of starving rabbits was drawn at definite intervals and the Cl, S and P were detd. Just previous to death from starvation the rabbit was bled from the carotid artery, the rest of the blood was washed out with a sugar soln., and the organs were removed and analyzed. The extractable Cl, S and P were detd. as follows: a weighed amt. of blood or mashed tissues was allowed to stand with occasional stirring in dil.  $\text{NH}_4\text{AcO}$  soln. made faintly acid with  $\text{AcOH}$ , the mixt. was then slowly raised to the b. p. while being stirred and filtered through ash-free paper under suction. This process was repeated 3 times. The combined filtrates were evapd. to small vol., a trace of protein was removed by animal C and the remainder used for the detns. In general the blood of fasting rabbits had a higher sp. gr. than that of normal animals. Cl in the blood begins to increase with fasting, reaching a max. in about 10 days; it may then drop somewhat but usually remains above the normal level throughout starvation. No relationship was established between the amt. of extractable S and starvation. The total P decreased slowly after a slight rise during the first few days. Extractable P showed a slight diminution in the earlier stages and then increased gradually. While acid-sol. P is rising the total P is falling with the progress of starvation. The salt content of starved animals bears no direct relation to starvation. The av. compn. of normal rabbits in mg. per 100 g. of tissue in liver, muscle and brain was resp.: total Cl 12.6, 8.8, 127.9, extractable Cl 10.6, 7.7, 120.3, total S 83.5, 76.8, 62.6, extractable S 8.8, 9.3, 10.5, total P 289.4, 168.8, 332.1, extractable P 55.8, 108.5, 47.6. L. W. RIGGS

**Energy exchanges in muscle. IV. Lactic acid formation in minced muscle.** OTTO MEYERHOF. *Arch. ges. Physiol. (Pflüger's)* 188, 114-60 (1921); cf. *C. A.* 15, 2307; 17, 816.—The amt. of lactic acid developed by minced muscle through the action of heat or contracting substances when the tissue is suspended in a buffered soln. is greater than the acid produced during the occurrence of rigor. When the muscle is suspended in a dibasic phosphate soln. in a H atm. the entire amt. of glycogen is changed to lactic acid. Here there is no fixed lactic acid max. Other solns. of the same osmotic concn. and  $p_H$  cannot be used as buffer solns. in the place of the Na or K phosphates. If such substances as glucose, hexosephosphoric acid, or glycogen are added to the muscle in the phosphate soln. during the early hours of the process the speed with which lactic acid is formed is unchanged, but if they are added later, at a time when the transformable carbohydrate is almost completely used up, the amt. of lactic acid formed is increased. Glycogen and glucose give the greatest yields. Bacterial action is not responsible for the transformation since the latter takes place in the presence of  $\text{HCN}$  (although retarded) and alc. (8% of ethyl alc. almost doubles the amt. of lactic acid formed from glycogen). The rate of lactic acid production in anaerobiosis is about 4 times as great as would be assumed from the detns. of the amts. of O used by muscle under aerobic and anaerobic conditions. A similar result is noted with intact muscle. The relation between oxidation and disappearance of lactic acid is further shown by the fact that the stimulation of O usage by the addn. of arsenite is paralleled by an increased loss in lactic acid. The addn. of caffeine has a like effect. The equil. between lactic acid formation and carbohydrate concn. observed in intact muscle does not obtain in minced muscle; in the resynthesis not all of the lactic acid goes back to glycogen. The relation seen in intact muscle between the lactic acid formed and the O used does not hold in either minced muscle or in muscle subjected to stimulation. Here the O usage may be increased 10- to 12-fold while the lactic acid formation may increase 20- to 30-fold, although both processes vary in the same direction. In general, all

substances which stimulate respiration also increase the formation of lactic acid. Na oxalate in 0.05 *M* soln. inhibits lactic acid formation almost completely and also reduces the respiration; alc., on the other hand, increases the lactic acid but inhibits oxidation. Extn. of the muscle with distd. water inhibits both processes. From a comparison of the conditions noted in intact muscle and those seen in minced tissue it appears that the increased respiration of the latter is actually the maximal (approx.) respiration of the intact muscle under the influence of the lactic acid formed.

Blood of domestic animals. V. Swine, sheep and goat blood. W. WEISCH. *Arch. ges. Physiol.* (Pflüger's) 198, 37-55(1923).—The following detns. are given:

	Goats		Sheep		Swine	
	Male.	Female.	Male.	Female.	Male.	Female.
Erythrocytes (in millions).....	13.39	14.49	11.60	9.80	7.59	7.29
Hemoglobin (g. per 100 cc. ....	10.7	11.0	12.7	11.3	16.8	15.4
Hemoglobin per red cell (g. $10^{-12}$ ).....	8.0	8.0	11.0	11.0	22.0	21.0
Hemoglobin per $\mu^2$ of red cell surface (g. $10^{-14}$ ).....		32		33		32
Leucocytes (in thousands).....	9.8	8.08	7.25	7.63	16.32	17.91
Refraction exponent of plasma.....	1.3491	1.3492	1.3488	1.3485	1.3492	1.3498
Plasma protein (%).....	7.6	7.7	7.4	7.3	7.7	8.0

G. H. S.

Effect of anions in the perfusion fluid upon the activity of the frog heart. HANS HANDOVSKY. *Arch. ges. Physiol.* (Pflüger's) 198, 56-64(1923).—Three types of effect upon heart activity can be induced by the incorporation of different anions into the perfusion fluid. Fluids with SCN or I ion increase the pulse vol., the abs. heart power, and the ability to withstand overloading. The frequency of the pulse is diminished or unchanged. There is also a tendency toward a hypertension of the contracted muscle and the development of a "latent tonus," since the heart perfused with iodide shows a greater increase in pulse vol. upon the application of strophanthin than does the heart untreated with I ion. There is almost always an increase in the min.-vol. as well. With fluids contg. I ion the effect of strophanthin upon pulse vol. and frequency is altered. The second type of effect upon heart activity is that induced by normal Ringer soln., with the Cl or Br ions. The third type, with SO<sub>4</sub> ions, varies somewhat in summer and winter frogs; under comparable conditions there is a decrease in pulse vol. and abs. heart power, and an increase in pulse frequency.

G. H. S.

Respiration of *Dixippus morosus*. W. v. BUDDENBROCK AND G. v. ROHR. *Z. allgem. Physiol.* 20, 111-60(1922).

G. H. S.

Digestion leucocytosis and digestion leucopenia in children. J. C. SCHIFFERS AND CORNELIA DE LANGE. *Z. Kinderheilk.* 33, 169-83(1922).

G. H. S.

Pharmacology of cell respiration. II. Role of iron in cell respiration. PH. ELLINGER AND M. LANDSBERGER. *Z. physiol. Chem.* 123, 246-63(1922); cf. *C. A.* 16, 3514.—In the cell Fe facilitates oxidation by activating O through the giving up of an electron, the activated O then reacting with oxidizable material concd. on surfaces (C particles or red cell stroma) present in the system. This opinion rests upon expts. showing that cell stroma, owing to their Fe content, when subjected to radiant energy become fluorescent. This is inhibited by KCN just as the oxidation of amino acids in the presence of stroma is inhibited by KCN. Narcotics have no influence on the fluorescence. KCN therefore is the only substance thus far shown to inhibit respiration by reason of its action on the Fe content of the system. In systems made up of cell stroma, erythrocytes or charcoal, amino acids and KCN the initial decrease in O consumption is followed by an increase; this is due to the oxidation of the KCN itself. KCNO is not the final oxidation product. III. The dependence of cell respiration on hydrogen-ion concentration. *Ibid.* 264-79.—The variations in oxidation rates with different H-ion concns. cannot be explained by variations in the reaction surface or extents of adsorption of substrate. The chief influence is probably on the chem. condition of the substrate.

R. L. STEHLÉ

Functional and anatomical study of the excretion of hemoglobin by the kidney. YOSHU FUKUDA AND JEAN OLIVER. *J. Exptl. Med.* 37, 83-95(1923).—The findings in hemoglobin excretion are best explained by the assumption of a filtration of this substance through the glomerulus and an additional excretion of it by the tubule cells. Absorption of H<sub>2</sub>O aids in the concg. process and is most marked in the collecting tubules.

C. J. WESS

**Antagonistic growth-activating and growth-inhibiting principles in serum.** ALEXIS CARRER, AND A. H. ERELLING. *J. Exptl. Med.* 37, 653-8(1923); cf. *C. A.* 16, 3913.—The substance pptd. by  $\text{CO}_2$  from the serum of chickens 1 or 2 yrs. old slightly increased the activity of pure cultures of a 10 yr. old strain of fibroblasts, an indication that a growth-promoting substance had been obtained from the serum. The rate of growth of fibroblasts was slower in serum deprived of its globulins and the increase of the inhibiting effect of the treated serum is thus manifested. It would appear that the inhibiting action of serum is referable to 1 or several growth-activating substances which are pptd. by  $\text{CO}_2$  and to 1 or several growth-retarding substances which remain in the supernatant serum after the ppt. has been thrown down by centrifugation. C. J. WEST

**Total bile. III. The bile changes caused by a pressure obstacle to secretion.** Hydrohepatosis. P. D. McMASTER, G. O. BROWN AND PRYTON ROUS. *J. Exptl. Med.* 37, 685-98(1923); cf. *C. A.* 17, 1664.—In bile that is secreted against an abnormally high pressure, as during partial obstruction, the pigment, cholate and cholesterol outputs are all cut down and so much more than is the vol. that the concn. is notably lessened. The fluid obtained at the greatest pressure compatible with secretion contains traces only of the typical biliary constituents. The term *hydrohepatosis* is applied to this condition. IV. The enterohepatic circulation of bile pigment. *Ibid* 699-710.—In dogs fed the green bile or the liver tissue of herbivora the bile later secreted frequently becomes green, changing from the previous yellow-brown. When they are fed sheep bile, that contains cholehematin, their bile comes to contain this pigment. When they are fed dog bile in quantity a well marked increase in the output of bilirubin by the liver frequently occurs. Taken together, these facts indicate the existence of an enterohepatic circulation of bile pigment. C. J. WEST

## G—PATHOLOGY

H. GIDEON WELLS

**The Wildbolz autogenous urine reaction.** H. GRASS. *Beitr. klin. Tuberkulose* 51, 157-66(1922).—The findings were entirely negative, the reactions being essentially of a chem. traumatic nature. It is believed, however, that antigenic substances are liberated in tuberculosis but whether this only occurs during the activity of the process appears questionable. Expts. with serum and tuberculin mixts. (Löwenstein's Auslösungssphänomen) also gave no information of value. In agreement with Trenkel the urine tests were found immediately painful (at times even necrosis followed), thus differing from the tuberculin reaction. The traumatic reaction is due to the salt content which could not be obviated. Tuberculin (antigenic substances) is appreciably weakened by concn. in the urine according to the Wildbolz method. H. J. CORPER

**Theory of Krysolgan action in tuberculosis.** ERNST LEVY. *Beitr. klin. Tuberkulose* 51, 171-6(1922). H. J. CORPER

**Albumose in the physiological and pathological state.** E. WOLFF. *Ann. med.* 10, 185-97(1921); *Physiol. Abstracts* 7, 295.—The albumose N is estimated in blood by comparing the amts. of N pptd. by phosphomolybdic acid and by metaphosphoric acid, resp., the difference in these two amts. of N being a measure of that present as albumose. By this method albumoses are found always to be present in the blood, both of animals and man. During fasting the quantity diminishes; during absorption of digested protein it is increased. In many fevers the amt. often exceeds the highest normal limit; in typhoid it invariably does so—a factor of diagnostic value. H. G.

**Studies of biological preparations by complement-fixation methods. I. Mallein: Antigenic variations and a proposed method of standardization.** R. A. WATSON AND L. M. HEATH. *J. Am. Vet. Med. Assoc.* 61, 503-14(1922); *Expt. Sta. Record* 47, 881-2.—The data show a marked variation in activity in the different malleins, the no. of units in a recommended diagnostic dose varying from 0 to 1,250. Alternate freezing and thawing of mallein were found to have no effect on its antigenic value or reactivity. H. G.

**The rhythm of hypophyseal polyuria in diabetes insipidus.** A. BERGÉ AND E. SCHULMANN. *Med. Press & Circ.* (London) 1921, i, 454-6; *Endocrinology* 6, 427.—The characteristics of the polyuria in diabetes insipidus are: (1) The quantity eliminated is variable. (2) The polyuria is more pronounced at night. (3) The quantity of urine excreted is at times greater than that of the fluid ingested. (4) There are no notable modifications of the excretion attributable to variations of régime. (5) There is no important disturbance of the chem. compn. of the urine; generally speaking there is a slowing of metabolism and a tendency to demineralization; the amt. of uric acid is small; there is no glucuronic disturbance. (6) Abs. renal integrity has been verified.

(7) There is a controlling action of ext. of the posterior lobe of the hypophysis on the polyuria. H. G.

**Pathogenetic relations between tetany and rickets.** E. FREUDENBERG AND G. GYÖRGY. *Munch. med. Wochschr.* 69, 422(1922); *Endocrinology* 7, 723.—Symptoms of rickets always exist in tetany. The Ca content of the blood in rickets is normal; the phosphates are decreased. In manifest tetany the Ca is always low, the phosphates, normal or slightly increased. In the urine in rickets the quantity of phosphates and  $\text{NH}_3$  is high (acidosis); in tetany it is low (alkalosis). So there is a real contrast between rickets and tetany. When a patient with rickets gets tetany, it means that his acidosis is changed into alkalosis. All drugs or other treatments producing acidosis may be useful.  $\text{NH}_4\text{Cl}$  produces a rise in the excretion of phosphates, a phosphate diuresis with a Ca retention. Ingestion of acids and starvation tend to cure tetany. H. G.

**The content of the blood in nitrogenous metabolites under physiological and pathological conditions.** H. F. HOSY AND R. HATLEHOL. *Norsk. mag. laegevidenskaben* 83, 1-16(1922); *Physiol. Abstracts* 7, 493.—Estns. were made of residual N, urea N, uric acid, and creatinine. The known values in health were confirmed. In diabetes, nephrosis, and nephrosclerosis, the values were much the same. In one nephritic patient there was increase of residual and urea N with normal uric acid values, in 2 others rise only of the uric acid value. In uremic cases there is a striking parallelism between a marked excess of residual N and the uremic symptoms, which suggests that it is here the cause of uremia is to be sought. H. G.

**Toremias of pregnancy.** O. L. V. DE WESSELOW AND J. M. WYATT. *Proc. Roy. Soc. Med.* 15, Section of Obstet., 57-65(1922); *Physiol. Abstracts* 7, 374.—Lipase in the blood is unaltered, fibrinogen is increased, but most stress is laid on the diminution of blood urea in pregnancy rather than on any inefficiency of the kidneys to excrete waste N. The decrease is attributable to lessened protein metabolism. H. G.

**The cholesterol content of the serum and immunity.** B. M. KOLDAEV. *Russ. J. Physiol.* 3, 139-42(1921); *Physiol. Abstracts* 7, 457.—No difference was found in the cholesterol content (Grigaut's method) of the serum of normal horses and horses immunized to tetanus, diphtheria, and typhoid. H. G.

**Experimental goiter produced by fluorine.** L. GOLDBERG. *Semana méd.* (Buenos Aires) 28, 628(1921); *Endocrinology* 6, 575-6.—The addn. of 2-3 mg. NaF to the food of young white rats during a period of 6-8 months produced chronic intoxication with retarded growth, etc. The thyroid increased in size; its parenchyma became compact, with considerable cellular hyperplasia. G. considers that this enlargement is equiv. to exptl. goiter. H. G.

**Colloidal content of human urine.** H. PRIEBAM AND F. EIGENBERGER. *Zentr. inn. Med.* 42, 961-5(1921); *Physiol. Abstracts* 7, 310.—The colloidal content of the urine is increased in febrile conditions, in diabetes, and in other conditions in which there is an abnormally rapid breakdown of tissue proteins. In diabetes the sugar is protected from oxidation by being "bound" by the products of protein breakdown. H. G.

**Studies of the blood gases in a case of paroxysmal tachycardia.** E. P. CARTER AND H. J. STEWART. *Arch. Intern. Med.* 31, 390-7(1923).—During an attack, the arterial  $\text{CO}_2$  content was 28.1%, the arterial  $\text{O}_2$  satn. 85.3% and the venous  $\text{O}_2$  satn. 16.7%. In part, this last was due to the anoxic anoxemia but the greater part was due to a true stagnant anoxemia due to slowing of the circulation. It disappeared within 1 hr. after the end of the attack. The vital capacity with regular heart action was from 64 to 68% of normal but 0.5 hr. after an attack it was only 39% normal. I. GREENWALD

**Gravimetric estimation of phosphates of the blood. Phosphates in nephritis.** WILLIAM J. FETTER. *Arch. Intern. Med.* 31, 413-22(1923).—The method of Emden (*C. A.* 16, 267) was adapted to the detn. of total P and inorg.  $\text{PO}_4$  in blood by detg. the former after oxidation with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  and the latter in the filtrate from a pptn. with  $\text{CCl}_3\text{COOH}$ . A high inorg.  $\text{PO}_4$  was observed in nephritis only when acidosis was present and it is suggested that  $\text{R}_2\text{HPO}_4$  was being mobilized to maintain the reaction of the body fluids. High values (25 mg.  $\text{H}_2\text{PO}_4$  per 100 cc. blood) were also obtained in a case of tetany with lowered alk. reserve. I. GREENWALD

**Albuminuria: its clinical significance as shown by chemical study of the blood.** T. H. COFFEN. *Arch. Intern. Med.* 31, 499-528(1923).—Albuminuria is frequently found in subjects in whom no other evidence of renal disease can be detected, for instance in orthostatic albuminuria and in cardiac disease, whether primarily valvular, myocardial or secondary to arterial hypertension. Analyses of the blood are to be preferred for diagnostic purposes, though the test diet for fixation of sp. gr. and for detn. of the rate of excretion of N, Cl and  $\text{H}_2\text{O}$  are also valuable. I. GREENWALD

**Distribution of sugar in whole blood, plasma and corpuscles; permeability of red blood corpuscles for sugar in diabetic and non-diabetic cases.** H. J. JOHN. *Arch. Intern. Med.* 31, 555-66(1923).—In the blood drawn from non-diabetic persons in the course of glucose tolerance tests, the concn. of glucose in plasma and corpuscles was nearly the same, whereas in diabetic blood obtained under the same conditions, the concn. in the plasma was always greater. The difference was not due to relative impermeability of the diabetic corpuscles to glucose for, when exposed for 2 hrs. to a 1% glucose soln., these took up more glucose than did non-diabetic corpuscles similarly exposed.

I. GREENWALD

**Acid-base equilibrium. I. Clinical studies in alkalosis.** ALFRED E. KOEHLER. *Arch. Intern. Med.* 31, 590-605(1923).—The blood plasma of 14 patients ill with fever was analyzed during the attack and after a return to normal temp. In 8 of these, there was a low  $\text{CO}_2$  capacity during the fever but this was not due to acidosis for the  $p_{\text{H}}$  was in each of the 14 greater during the fever than subsequently. Since starving produces a true acidosis and since these subjects received little food, the effect of the fever in producing an alkalosis was really greater than was apparent. Similar effects were obtained with hot baths. The effects of both fever and hot baths are believed to be due the hyperpnea existing under these conditions. Cyanosis appearing under these conditions is believed to be due to the increased stability of oxyhemoglobin in this more alk. blood. Cf. Greenwald, *C. A.* 17, 139 and Morris, *C. A.* 16, 2176.

I. GREENWALD

**Physical and chemical studies of human blood serum. I. A study of normal subjects.** D. W. ATCHLEY, R. F. LOBE, ETHEL M. BENEDICT AND W. W. PALMER. *Arch. Intern. Med.* 31, 606-10(1923).—The following determinations were made upon 28 samples of serum from 18 normal persons: depression of f. p., specific cond. at 25°, refractive index,  $\text{Cl}$ ,  $\text{HCO}_3$ , glucose, non-protein N, total N, and, in some cases, urea, P, Na and K. "There are but relatively slight variations between detns. on the same and on different individuals, although the blood samples were collected without regard for the time of day or diet." II. A study of twenty-nine cases of nephritis. *Ibid* 611-5.—Detns. were made upon 52 samples obtained from 5 cases of acute nephritis, 9 of uremia and 15 of chronic nephritis, with and without edema. In certain cases of  $\text{Cl}$  and  $\text{H}_2\text{O}$  retention, the cond. was greater than would be expected from the  $\text{Cl}$  concn. III. A study of miscellaneous disease conditions. *Ibid* 616-21.—Detns. were made upon 76 samples obtained from 11 cases of cardiac insufficiency with edema, 6 of diabetes, 5 of acute respiratory infection, 2 of toxemia of pregnancy, 3 of cirrhosis of the liver with ascites, 2 of tuberculous pleurisy, 2 of diabetes insipidus, 1 of cerebral hemorrhage, 1 of pyloric stenosis, 2 of malignancy of the peritoneum and 1 of ascites of unknown etiology.

I. GREENWALD

**Antianaphylactic action of lipoids.** C. DUPREZ. *Compt. rend. soc. belge biol.* 1922, 13; *Physiol. Abstracts* 7, 138(1922).—When 5 cc. of Bordet's antigen (alc. ext. of calf heart previously treated with acetone) are evapd., and the residue is emulsified in 2 cc. of physiol. saline and then injected intravenously into a guinea pig, all exterior manifestation of shock is suppressed, provided this injection be made 1 hr. prior to injection of the anaphylactic dose; the exptl. animal is rendered sensitive by means of horse serum or by intravenous injection of either 5 cc. of gelose serum or 1 cc. of 0.5% suspension of gelose.

JOSEPH S. HEPBURN

**An unknown iron pigment in the human spleen.** E. J. KRAUS. *Beitr. path. anat.* 70, 234-47(1922).—A hitherto unobserved light green pigment appears to be, by microchem. tests, Fe phosphate, either pure or slightly bound. It is found only in the spleen and principally in conditions which lead to anemic necrosis but also in hemorrhages and atrophy.

JULIAN H. LEWIS

**Hemosiderosis.** ULRICH STRASSER. *Beitr. path. anat.* 70, 248-64(1922).—The pigment in hemosiderosis is believed to be Fe oxide.

JULIAN H. LEWIS

**The preservation of precipitating antisera.** H. BEGER. *Centr. Bakt. Parasitenk.* 1 Abt. 89, 210-3(1922).—Such sera are preserved by adding Cu foil, 1 sq. cm. to 1 cc. for 10-14 days.

JULIAN H. LEWIS

**The distribution of indican in the organism under normal and pathological conditions.** ERWIN BECHER. *Dent. Arch. klin. Med.* 134, 325-30(1920).—There is no indican in the tissues under normal conditions. Under certain conditions of renal insufficiency indican appears in the tissues and the amt. of increase of indican in the blood depends on how much goes into the tissues. In nephrectomized dogs there is a greater accumulation of indican in the blood than of residual N. In recent cases of renal insufficiency less indican goes into the tissues than in long standing cases. In azotemia of acute nephritis there are relatively small amts. of indican in both blood



and tissues. The brain retains less indican than any of the tissues and whole blood contains less than serum.

JULIAN H. LEWIS.

**Serum concentration and viscosity of the blood in myxedema and the influence of iodothylin.** GUSTAV DRUSCH. *Deut. Arch. klin. Med.* 134, 342-51(1920).—In myxedema the viscosity of the blood lies within normal limits, but the viscosity of the serum is constantly increased. The  $\eta$  of the serum is increased in myxedema as a result of an increased protein content. The increased viscosity and  $\eta$  are not found in other forms of edema and in myxedema they are relieved by iodothylin. The increased serum protein of myxedema is partly relative, owing to a lowered  $H_2O$  content but is also abs. This increased protein content is lowered when iodothylin is fed. The NaCl content of the serum is not changed in myxedema. Practically these facts can be used to differentiate other forms of edema and thyroid disturbances and to measure the therapeutic effects of thyroid administration in myxedema. JULIAN H. LEWIS.

**The distribution of rest nitrogen in human organs and tissues under normal and pathological conditions.** ERWIN BECHER. *Deut. Arch. klin. Med.* 135, 1-38(1921).—Under normal conditions the tissues contain more aburet N than the blood. The amt. of excess depends on the protein,  $H_2O$  and fat content of the tissues. Edematous tissues have a lower, protein-rich ones have a higher content of rest N. Fat tissue contains only a small amt. of rest N which is not markedly increased in kidney insufficiency. Rest N in the brain is usually lower than in other organs, as muscle, liver and spleen and is probably due to the rich content of lipoids. There is also a low value for the lungs. The rest N in the spleen and liver shows marked variation. That of the kidney and intestines is also less constant than that of others. In the pancreas, as the result of rapid post-mortem autolysis the rest N is high. Intestinal muscle contains less than heart and skeletal muscle, the latter having more than the heart. Only a slight increase of rest N is found in acute febrile disease without renal affection. In renal disease without insufficiency the blood as well as all the tissues have a high rest N content. This increased rest N is distributed among the tissues in the same proportions that are observed normally. The amt. of retention is proportional to the severity of the clinical symptoms, the highest being in true uremia. The increased residual N is due mostly to urea. It was estd. that one cadaver contained 200 g. of retained urea.

JULIAN H. LEWIS.

**Kidney changes in lead poisoning and gout.** AD. M. BROGSITTER AND H. WODAKZ. *Deut. Arch. klin. Med.* 139, 129-42(1922).—Uric acid deposits and necrotic areas were found in only 2 kidneys from 14 cases of gout. Since all 14 were typical and had been observed a long while it is concluded that uric acid deposits in kidneys from gout occur infrequently. The blood vessels in Pb poisoning and gout are similar and are extremely altered. In the medium-sized arteries there is a marked hypertrophy as the result of high blood pressure. In the smaller vessels there are inflammatory changes and some pure degenerative processes. In the glomeruli both inflammation and degeneration are found, the former being more marked in gout. In the tubules the changes are different for the 2 conditions. In Pb poisoning there is a loss of epithelium while in gout the tubules are intact save for an anemic atrophy of tubuli recti. Pb poisoning changes are grouped around the blood vessels while those in gout occur in foci throughout the kidney.

JULIAN H. LEWIS.

**The interpretation of fatty changes in parenchymatous organs.** F. MUNK AND H. ROTHER. *Deut. Arch. klin. Med.* 140, 137-47(1922).—Errors are pointed out in the expts. of Grosz and Vorpahl (*C. A.* 9, 657) from which the latter conclude that in fatty morphoses of parenchymatous organs the fat arises from the transformation of proteins into fatty acids. (See also Underhill and Hendrix, *C. A.* 9, 3281.) JULIAN H. LEWIS.

**The role of blood uric acid in the diagnosis and prognosis of nephritis.** G. CZOZNICZER. *Deut. Arch. klin. med.* 140, 288-301(1922).—Uric acid is retained in the blood in the slightest disturbances of kidney functioning. In the diagnosis of nephritis the estn. of blood uric acid can within certain limits replace non-protein N detns. A normal uric acid blood content excludes a retention of non-protein N. A uric acid retention of over 6.0 mg. % goes with a retention of 100 mg. % of non-protein N. A parallel detn. of blood uric acid and non-protein N often gives an idea of the nature of the kidney lesion. In nephrosclerosis the increase of blood uric acid precedes that of non-protein N. In acute nephritis the blood uric acid increases without the non-protein N increasing. An increase of blood uric acid over 9.0 mg. % indicates a bad prognosis. At the approach of uremia there is a rapid rise in blood uric acid while the non-protein N remains const. The same has been observed in eclampsia which suggests the similarity in cause of the 2 conditions, i. e., a retention of waste products.

JULIAN H. LEWIS.

**Urobilinuria in health and disease.** A. ADLER. *Deut. Arch. klin. Med.* 140,

302-22(1922).—Urobilin in the urine is a const. factor. The daily excretion is 20-25 mg. Hunger and the taking of food, especially that rich in protein, cause an increase. The largest amt. of urobilin found in the urine occurs in degenerative diseases, amounting to as high as 1 g. per day. Next are the generalized toxic infectious diseases as croupous pneumonia, scarlet fever and typhoid. The urobilinuria in these diseases may amount to 600 mg. per day. Tuberculosis shows a high urobilinuria. Local infections, as diphtheria and dysentery, show a low urobilin value. Hemolytic icterus shows a urobilinuria of 300-400 mg. per day. After the injection of adrenaline there is an increase of urobilin in the urine and of bilirubin in the blood. In pernicious anemia there is an excretion of 30-50 mg. daily and in the aplastic form of anemia the amt. is scarcely more than normal. In acute leucemia there is a high excretion while in chronic leucemia there is a small excretion. In polycythemia there is an increased excretion. The excretion is not increased in slight and medium diabetes, while it is increased in the severe type. Urobilinuria proves to be the finest indicator of a retention of bile constituents in the blood.

JULIAN H. LEWIS

The calcium content of human blood serum and the influence on it of disturbances of internal secretions. HANS LEICHER. *Deut. Arch. klin. Med.* 141, 85-116(1922).—The Ca content of human blood serum, detd. by the Waard method (*C. A.* 14, 1559), is const. during different age periods. It decreases to 55 yrs. and from then on it lies between 10.6 and 11.2 mg. %. The administration of primary Ca phosphate to normal individuals causes no change in the Ca content of the serum. Thyroid preps. cause a lowering of the serum Ca and in Basedow's disease there is a low Ca content. Iodides cause no change in normal individuals. In myxedema there is an increased amt. of Ca in the serum. In 9 cases of goiter without hyperthyroidism, 3 showed a normal Ca figure, 3 an increased and 3 a decreased Ca content in the serum. After the subcutaneous injection of hypophysis preps. there is a decrease of serum Ca and in 2 cases of hypophyseal dystrophia adiposogenitalis there was an increased amt. of Ca in the serum. The subcutaneous injection of suprarenine caused a decrease of serum Ca. In parathyroid tetany the serum Ca is lowered about  $\frac{1}{2}$  from the normal value. No influence of the sex glands could be detd. There is a tendency to a low Ca figure in late pregnancy and post partum.

JULIAN H. LEWIS

Structure of complement. I. L. KRICHVSKII AND A. I. DOUCHOVSKI: *J. Infectious Diseases* 32, 187-91(1923).—The sap of *Coryledon scheideckeri* has the power of inactivating guinea-pig complement. The pptn. produced in the serum by the sap is not always followed by the inactivation of complement. This phenomenon is due, not to destruction of the complement or to its chem. decompn., but to the absorption of the complement by the ppt. Precise conditions are necessary for the absorption of complement, i. e., the presence of hemolytic serum is one of these conditions. The presence of guinea-pig serum heated to 54° for  $\frac{1}{2}$  hr. makes the absorption of the complement by ppt. impossible in the majority of the cases. Guinea-pig serum conserves its protecting functions against complement when heated to 65° and even to 75° for 1 hr.

JULIAN H. LEWIS

The relation of immunity reactions to the biogenetic law. I. L. KRICHVSKII. *J. Infectious Diseases* 32, 192-5(1923).—The hen egg and the formative yolk (the spot) do not contain heterogenous sheep antigen. In earlier phases of the development (2 days), the protoplasm of the hen embryo does not possess heterogenous sheep antigen. The heterogenous sheep antigen producing hemolysins against red corpuscles of sheep appears only in relatively advanced periods of the development of the hen, i. e., not before 4 days after the division of the egg began. It can be stated that the biochem. properties of animal cells are subject to transformation during the ontogenetic development.

JULIAN H. LEWIS

Heterogenous anaphylaxis. I. L. KRICHVSKII. *J. Infectious Diseases* 32, 196-203(1923).—Rabbits immunized with red blood cells of the hen produced anaphylactic antibodies against red blood cells of sheep. The animals that presented the picture of heterogenous anaphylaxis always possessed heterogenous hemolysins, and in the majority of cases the anaphylactic phenomena were directly connected with the degree of the hemolytic titer.

JULIAN H. LEWIS

Concerning the influence of the intravenous administration of mercury benzoate on the Wassermann reaction of apparently normal individuals. ALBERT STRICKLER. *J. Lab. Clin. Med.* 8, 465-7(1923).—Intravenous administration of mercurials does not influence the Wassermann reaction. A 4 plus reaction was not influenced by 20 intravenous injections. 37 injections failed to cause a positive reaction in a normal subject.

E. R. LONG

Diagnostic value of the Kahn test for syphilis. MARGARET S. GRANT. *J. Lab.*

*Clin. Med.* 8, 468-72(1923).—The pptn. test of Kahn, requiring only antigen and patient's serum, is less complicated than other pptn. tests. There is less chance of error in technique than in the Wassermann reaction. The reaction of Kahn is a valuable check on the W.r. As at present developed the test does not seem to be of particular value with spinal fluid. E. R. LONG

**The employment of vegetable extracts in the Wassermann reaction.** EMIL WEISS. *J. Lab. Clin. Med.* 8, 476-80(1923).—Alc. and acetone exts. of olive and coconut are useful antigens for the W. r. The difference in results between animal and vegetable exts. is no greater than that between 2 different animal tissue exts. The addn. of cholesterol increases the breadth of the sp. zone just as with animal exts. For the extn. of vegetables 95% alc., abs. alc. and acetone are equally useful. The durability of the vegetable exts. at room temp. is the same as that of animal tissue exts. E. R. LONG

**Heredity in alkaptonuria.** C. F. CUTHBERT. *Lancet* 1923, I, 593-4. E. R. L.  
**The influence of pituitrin on cerebrospinal fluid.** R. FUJINO. *Intern. Med. News* (Japan) No. 1024(1922); *Japan Med. World* 3, 32(1923).—The cerebrospinal pressure was raised by the subdural injection of 0.3-0.7 cc. of pituitrin. In the normal fluid there were no changes in the contents, but in the fluids of cases of progressive paralysis, tabes dorsalis and syphilis of the central nervous system, there was a decrease of the pathol. contents. M. E. MAVER

**Effect of heating on the agglutinability of typhoid bacillus.** K. YAMAGUCHI. *J. Chiba Med. School* No. 145(1922); *Japan Med. World* 3, 51(1923).—The lessened agglutinability is due to the increased viscosity of the bacillary emulsion. Addn. of acids nearly restores the original viscosity and agglutinability. M. E. MAVER

**Effect of alkalis on the agglutinability of typhoid bacillus.** K. YAMAGUCHI. *J. Chiba Med. School* No. 145(1922); *Japan Med. World* 3, 51(1923).—The agglutinability of typhoid bacilli treated with a 1% KOH soln. and then neutralized was lessened against the serum immunized with live typhoid bacilli, but remained unchanged against the serum immunized with the typhoid bacilli heated at 80-100° for 2 hrs. M. E. MAVER

**Poisoning with *Olinidioides formosa* goto.** T. AOKI. *J. Dermatology and Urol.* (Japan) 22, No. 9(1922); *Japan Med. World* 3, 55(1923).—A. first deals with the zoology of the jelly fish prevailing in the sea near Nagasaki. The poisoning is so severe that serious manifestations occur, such as general malaise, emaciation, muscular pain and difficulty in breathing. A. carried out immunological studies with the poison and obtained a serum having some power to neutralize the action of the poison. M. E. MAVER

**The physiological action of the constituents of serum on visceral toxins.** H. WAGO. *J. Exptl. Med.* (Japan) 6, No. 8(1922); *Japan Med. World* 3, 53(1923).—Inactivated normal and trypsin-immunized rabbit sera had no power to detoxify the exts. of the lungs of the mouse. The albumin in the sera is responsible for most of the detoxifying power, although the globulin and other constituents of the sera are active also. M. E. MAVER

**The serological study of heterogeneous albumins.** Y. HIKI. *J. Exptl. Med.* 6, No. 9(1922); *Japan Med. World* 3, 54(1923).—The albumin of bean produces sp. precipitin in the serum of the injected animal. When administered *per os* some of the albumin is absorbed without losing its antigenic property, but as soon as it reaches the liver it is made inactive. This is demonstrated by the fact that albumin injected into the portal vein causes a less severe shock than when injected into the "pedestal" vein. M. E. MAVER

**Action of calcium and magnesium salts on transplantable sarcoma of rats.** T. HOSHINO. *J. Osaka Med. Soc.* 21, No. 11(1922); *Japan Med. World* 3, 51(1923).—CaCl<sub>2</sub> interrupts the growth of the transplanted tumor, but MgCl<sub>2</sub> enhances the growth. The administration of a mixt. of these substances prevents the growth of the sarcoma. M. E. MAVER

**Agglutinin in the saliva of typhoid cases.** H. NISHIGUCHI. *J. Osaka Med. Soc.* 21, No. 12(1922); *Japan Med. World* 3, 52(1923).—Contrary to the view of Widal and Sicard, N. demonstrated the agglutinin in the saliva of 81% of a total of 86 cases, the titer being 1:5-1:10. 4.2% of these positive cases reacted positively with paratyphoid bacilli A and B. All the control tests made with the saliva of 84 normal and 15 fever cases, other than typhoid fever, proved negative. M. E. MAVER

**Physico-chemical actions on antibodies.** K. IWAI. *J. State Med.* (Japan) No. 428(1922); *Japan Med. World* 3, 56(1923).—Dessication had little effect on antibodies. The destructive action of sunlight was in direct proportion to the dilution. Hemagglutinin had a greater resistance to sunlight than hemolysin. Benzene, chloroform, toluene, turpentine, and xylene had hemolytic power in the order given. This action

interrupted by the addn. of serum. The resistance of various antibodies to heat was not const.

**Serological studies on fibrinogen.** K. KATO. *J. Tokyo Med. Soc.* 36, No. 10 (1922); *Japan Med. World* 3, 35(1923).—K. produced immune serum by injecting a mammal with mammalian fibrinogen. The serum acted not only on fibrinogen of the same species, but also on that of other species of mammals. It had little if any action on avian fibrinogen.

M. E. MAVER

**Antitrypsin in pathological body juices.** S. HAYASHI, S. AOI AND N. YOSHIDA. *Med. News (Japan)* No. 1106(1922); *Japan Med. World* 3, 32(1923).—In the cerebrospinal fluids of cases of acute cerebrospinal infection, increased trypsin contents were found. The quantity of trypsin was not altered by the injection of serum and the higher the concn. the worse was the prognosis.

M. E. MAVER

**The properties of syphilitic sera in relation to the specificity of immunity reactions.** J. HOLKER. *J. Path. Bact.* 25, 281(1923).—Physiologically normal NaCl soln. is not merely an inert substance in the Wassermann reaction, for maintaining a correct osmotic pressure for the red corpuscles. It is an essential reagent. The specificity of the reaction seems to be closely related to the use of an electrolyte. Saline ppts. the suspension antigen but disperses the emulsoid serum. It increases the protective power of serum. Negative serum is much more protective than positive serum. The protein particles form a protective coat around the antigen particles. There is apparently an increase of euglobulin in syphilitic serum.

JOHN T. MYERS

**The opacity of a mixture of serum and Wassermann antigen in progressively increasing concentrations of sodium chloride.** J. HOLKER. *J. Path. Bact.* 25, 291-6 (1922).—When antigen was quickly dild. with distd. water and mixed with serum and increasing amts. of NaCl a periodic curve was obtained between the salt concns. of 0 to 10%. This periodicity is less with syphilitic than with normal serum. When the reagents were mixed slowly a regular increase in opacity occurred with the increase in salt concn. All opacity curves for syphilitic sera were higher than those for normal serum, hence its protective power is less. The high degree of aggregation of the serum-antigen complex for syphilis is a suitable condition for the adsorption of complement.

JOHN T. MYERS

**A study of the effects of electrolytes on hemolysis.** H. D. WRIGHT AND PETER MACCALLUM. *J. Path. Bact.* 25, 316-34(1922).—In the production of zone phenomena in hemolysis the so-called inert constituents of the serum play an important part. The power of both cations and anions to inhibit hemolysis increases with valence. Combination of complement with sensitized cells is inhibited in isotonic glucose solns. Power to restore hemolysis in glucose has an inverse relationship to power to inhibit hemolysis in physiological saline. This effect is apparently due to physicochem. changes in the proteins of the serum.

JOHN T. MYERS

**The influence of anesthesia on the restoration of the volume of the blood after hemorrhage and after transfusion.** A. E. BOYCOTT AND C. P. JONES. *J. Path. Bact.* 25, 335-45(1922).—Under anesthesia the restoration of blood vol. is slower, probably due to a diminution of permeability of the capillary wall to a liquid passing from the tissue fluid to the blood.

JOHN T. MYERS

**A comparison of the Wassermann and sigma reactions in 1500 tests.** A. STOKES AND J. T. WIGHAM. *J. Path. Bact.* 25, 405-6(1922).—The substance looked for seems to be the same in each test.

JOHN T. MYERS

**A study of orthostatic albuminuria by means of graphic records.** J. W. RUSSELL. *Brit. J. Med.* 16, 73-94(1923).—There appears to be a group of mild kidney lesions which reveal themselves chiefly by the inability of the kidney to bear, without leakage of albumin, the circulatory disturbance caused by the upright position. In no case was the bed urine always free from albumin. The later day cessation of albuminuria was variable. There is a close association between amt. of urine secreted and concn. of albumin. Usually the two curves are inverse. Most cases show a marked delay in the secretory response to the intake of fixed amts. of fluid.

JOHN T. MYERS

**Role of the oxidizing enzymes in the production of fever and of inflammations.** J. MARINESCO. *Compt. rend.* 175, 1114-6(1922).—M. discusses increased body and tissue temp. which is considered to be a function of the activity of the oxidizing enzymes.

L. W. RIGGS

**Relations between the resistance of the organism to poisons and the rapid modification of the oculo-cardiac reflex. (Contribution to antianaphylaxis.)** L. GARRELLON AND D. SANTENOISE. *Compt. rend.* 176, 861-4(1923).—Expts. with dogs by injecting the double cyanide of Zn and K, 0.003 g. per kg., and following at 15 min. intervals with 3 injections of 0.01 g. pilocarpine were not followed by the death of the animal.

Similar results were obtained with strychnine. These expts. show that the states, in which the oculo-cardiac reflex is slightly marked, null or inverse, are states of resistivity, and further that during the time that the interior medium is modified by the penetration of a foreign substance, the resistance of the organism is marked by an inversion of the neurovegetative tonus, with diminution, suppression or inversion of the reflex. The resistance seems all the more efficacious as the neurovegetative system is capable of a rapid inversion. It is by this inversion that the production of antianaphylaxis is explained. These principles are applied to pathol. conditions caused by bacterial toxins.

L. W. RIGGS

**Alcohol precipitate of serum as antigen.** RYO TSUKASAKI. *Tohoku J. Exptl. Med.* 3, 653-7(1922).—The human serum obtained from a dead body is pptd. by the addn. of alc. After filtering it the remainder is dried and injected into the vein of a rabbit. The animal was thus immunized and furnished a highly active and sp. precipitin serum. Serum powder made in this manner is preservable for 1 year or more.

L. W. RIGGS

**Blood sugar content of the rabbit after the ligation of the renal vessels.** SACHIKADO MORITA. *Tohoku J. Exptl. Med.* 3, 226-65(1922).—The bilateral ligation of the renal vessels, artery and vein together, or the renal veins alone, causes in normal rabbits, first a temporary hyperglucemia immediately after the ligation, and secondly the hyperglucemia, which makes its appearance on the last days, increases with time, and either increases till the death of the animal or decreases finally toward the time of death. The hyperglucemia immediately after the ligation of artery and vein together is on a smaller scale and of shorter duration, in comparison with that after the ligation of the renal veins alone. The ligation of the renal veins alone in the rabbit, of which the renal nerve plexus has been previously divided, yields the same result as the ligation of artery and vein together in normal rabbits. Either form of ligation failed to produce hyperglucemia in a bilaterally splanchnectomized rabbit. Such hyperglucemia are of central mechanism. The severity and duration of the hyperglucemia on the last days after the ligation are indifferent to the form of ligation. This form of hyperglucemia is of a mechanism other than the central one. **The virtual sugar of the blood after ligation of the double renal vessels.** *Ibid.* 279-87.—The virtual sugar of the blood increases more or less after ligation of the double renal vessels. The combined sugar after ligation diminishes, because the increase of the free sugar was stronger than that of the virtual sugar.

L. W. RIGGS

**Drowning hemoglobinuria.** KUMAO YAMAKAMI. *Tohoku J. Exptl. Med.* 3, 295-304(1922).—Rabbits drowned in a hypotonic medium (water) up to the stage of unconsciousness manifest hemoglobinuria, without exception, within 1 hr. Many rabbits immersed in water and drawn out of it before their consciousness is disturbed manifest hemoglobinuria. Erythrocytes less than 0.06 cc. per kg. wt., hemolyzed by adding distd. water, can be injected intravenously into rabbits without causing hemoglobinuria, but more than 0.5 cc. per kg. when injected produces hemoglobinuria within 5 min. Animals dying of quick submersion show no hemoglobin in the urine in the bladder, but in slow submersion hemoglobin can be detected in the urine of the bladder of the drowned as a sign of drowning.

L. W. RIGGS

**Blood sugar studies. II. Alimentary hyperglucemia in normal persons, in diabetics and in those with exophthalmic goiter.** MAX ROSENBERG. *Arch. exptl. Path. Pharmacol.* 93, 208-40(1922); cf. *C. A.* 17, 2124.—In normal individuals the high point in the blood sugar curve after the ingestion of 100 g. of sugar is about 0.1 g. % higher than the fasting value, and the time relationships involved in the increase and disappearance of sugar are characteristic. In diabetics, after a like ingestion of sugar the curve of blood sugar is characterized by higher values and by a greater duration of the hyperglucemia. In cases of exophthalmic goiter curves are obtained which resemble, in some cases the normal, in others the diabetic types.

G. H. S.

**Stable suspensions of autoagglutinable bacteria.** P. H. DE KRUIF and J. H. NORTROP. *J. Exptl. Med.* 37, 647-51(1923).—Autoagglutinating cultures of Type G, bacillus of rabbit septicemia, can be rendered stable by suspensions in glycine-acetate-phosphate buffer mixt.,  $p_H$  7.5 and 7.1. Distd.  $H_2O$  suspensions can also be employed if the normal and immune serum under test is dild. with buffers of this  $p_H$  instead of with 0.85% NaCl. Five intensely autoagglutinable strains of *Streptococcus hemolyticus* have been stabilized by washing and suspending in 0.001 N NaOH. Sp. agglutination of these stable suspens. by rabbit antistreptococcus serum could be demonstrated by dild. the serum with M/320 NaCl.

C. J. WESS

**Surface tension of serum. V. Relation between time-drop and serum antibodies.** P. LECOMTE DU NOUY. *J. Exptl. Med.* 37, 659-69(1923); cf. *C. A.* 16, 2698; 17, 114.—

An attempt was made to apply to the study of immune serum the fact that at a given diln. the serum showed a max. drop of surface tension in function of time. The time drop of a serum soln. is greater after the animal has been immunized than before immunization (from 50-100%), and is at a max. at a diln. of 1:10,000. The size of the mol. or micellae is probably unchanged after immunization, since the max. drop is not shifted here. Measurements made during the process of immunization showed that the time-drop increases after the 8th day and 2nd injection and reaches a max. towards the 13th day, while the controls undergo no increase. The injection of substances non-productive of antibodies, such as homologous cells or turpentine, does not result in the production of a permanent max. The measurement of the refractive index of the sera failed to demonstrate any differences between the sera of the control and those of the exptl. animals.

C. J. WEST

The absorption of specific agglutinins in homologous serum fed to calves during the early hours of life. THEOBALD SMITH AND R. B. LITTLE. *J. Exptl. Med.* 37, 671-83 (1923).—The administration of cow serum by feeding may replace colostrum (*C. A.* 16, 3971). The agglutinins towards *Bacillus abortus* in it are absorbed during the 1st hrs. of life in relatively large amounts when compared with those naturally appearing in ordinary milk. It seems probable that colostrum is the most efficient transporting agent of the antibodies.

C. J. WEST

#### H—PHARMACOLOGY

ALFRED N. RICHARDS

The value of ergot in obstetrical and gynecological practice, with special reference to its present position in the British Pharmacopoeia. H. H. DALE. *Proc. Roy. Soc. Med.* 16, Sect. Obst. Gynecol. and Therap. 1-7 (1923).—A critical review, followed by a discussion.

A. T. CAMERON

The character of the intravenous injection of sublimate-arsphenamine of Linser. STEPHAN ROTHMAN. *Deut. med. Wochschr.* 47, 71-2 (1921); *Abstracts Bact.* 5, 481.—In the mixing of arsphenamine with  $\text{HgCl}_2$  metallic Hg is pptd. secondarily, while the reduction produces  $\text{HgCl}$ . The oxidation of the arsphenamine must be comparatively small. The favorable therapeutic action of the mixt. is due presumably to the colloidal metallic Hg and perhaps also to the change in dispersion of the arsphenamine.

H. G.

Organothrapy in diabetes. K. LOENING AND E. VAHLEN. *Deut. med. Wochschr.* 48, 217-9 (1922); *Endocrinology* 6, 426.—Vahlen has prepd. a substance from the pancreas of a cow, which he calls metabolin. There is a substance in yeast differing only slightly from metabolin. Administration of this substance to diabetics has 1 of 3 effects: (1) absolutely no result; (2) the sugar in the urine diminishes; (3) the sugar disappears. The authors fail to tell the prepn. of the substances used and do not give the quantity of blood sugar.

H. G.

Variations of the hematic reaction to "lymphogangline." A. MAZZARELLA. *Riforma med.* (Napoli) 37, 1103-4 (1921); *Endocrinology* 6, 554.—A preliminary note on the action of lymphatic ganglia ext., which increases the no. of the white corpuscles, but modifies the formula by inducing mononucleosis and eosinophilia. The eosinophilia differs from that produced by serum or excitation of the vagus (pilocarpine). The expts. confirm the observations of Marfori and Chistoni that lymphoganglium has a hormonal action antagonistic to adrenaline.

H. G.

A new modification of mercury-arsphenamine therapy: treatment with neoarsphenamine and cyarsal in the mixing syringe. F. W. ORLZER. *Münch. med. Wochschr.* 68, 271-2 (1921); *Abstracts Bact.* 5, 481.—Cyarsal is the K salt of a Hg compd. of hydroxybenzoic acid contg. about 46% Hg. One valence of the Hg is firmly bound to the C of the nucleus and the other to the isocyanide group. Neither  $(\text{NH}_4)_2\text{S}$  nor arsphenamine is able to split off this Hg. The cryst. compd. is sol. in water and can be administered simultaneously with arsphenamine. The immediate effects upon syphilis have been encouraging.

H. G.

The influence of the endocrine organs on the calcium content of human serum. LEICHRER. *Münch. med. Wochschr.* 69, 331, 797; *Klin. Wochschr.* 1, 1282 (1922); *Endocrinology* 6, 689.—In Graves' disease and after ingestion of thyroïdin the Ca content of the serum sinks; in myxedema it is high; after ingestion of hypophysis it sinks; in a case of tumor of the hypophysis it is high; ingestion of ovary causes a decrease; castration causes an increase; injection of adrenine causes a decrease and ingestion of parathyroid, an increase.

H. G.

The action of atropine, adrenaline, and pilocarpine. O. PLATZ. *Münch. med.*

*Wochschr.* 69, 727(1922); *Endocrinology* 6, 845-6.—For the action of atropine see C. A. 17, 827. Even 0.001 mg. of adrenaline given intravenously produces a marked rise of blood pressure. This increase does not parallel the quantity of adrenaline injected. In 116 of 121 patients adrenaline caused an increased pulse rate. Respiration is quickened and the blood sugar and NaCl in the blood are increased. Erythrocytes and leucocytes are increased along with neutropenia, eosinophilia, and lymphocytosis. The mononuclears may be increased or decreased. General symptoms, such as headache, are much more marked after intravenous than after subcutaneous injections. Even 18 mg. of adrenaline given intrarectally has no effect. For the action of pilocarpine see C. A. 17, 590. H. G.

**The influence of adrenaline on the excretion of uric acid.** E. KRAUSS. *Münch. med. Wochschr.* 69, 761(1922); *Endocrinology* 6, 665; cf. C. A. 17, 143.—Though the blood contains much uric acid in primary hypertonia, the urine contains but little. When adrenaline is injected in healthy persons the excretion of N, urea, creatinine and NaCl is augmented; the excretion of uric acid is diminished as soon as the blood pressure rises. The excretion of water may be increased or diminished. When the blood pressure is high after the injection of adrenaline the serum contains large amts. of uric acid. The excretion of the uric acid seem to depend upon the blood pressure. H. G.

**Influence of adrenaline in different concentrations on blood pressure and blood sugar.** WEINBERG. *Münch. med. Wochschr.* 69, 797; *Klin. Wochschr.* 1, 1282(1922); *Endocrinology* 6, 850.—Very small quantities of adrenaline cause the blood pressure to sink, large quantities produce a rise. When adrenaline is given intravenously, but so slowly that the injection takes  $\pm 1$  hr. the blood sugar is diminished. No details are given. H. G.

**Changes in the hydrogen-ion concentrations after injection of adrenaline.** POHLE. *Münch. med. Wochschr.* 69, 797; *Klin. Wochschr.* 1, 1281(1922); *Endocrinology* 6, 667. — In both the vena porta and the vena hepatica the H-ion concn. was largely increased after injection of adrenaline. This increase was preceded by the rise of the blood sugar. H. G.

**Action on blood pressure of adrenaline injected into the subarachnoid space.** M. KASAHARA. *Kyoto Igakkwai Zasshi* 18, No. 2; *Japan Med. World* (Tokyo) 1, 26 (1921); *Endocrinology* 6, 530.—Injection of con. adrenaline into the subarachnoid space of the rabbit causes a lowering of blood pressure due to the acidity of the prepn. The work of Meltzer and Auer along this line has no clinical significance. An injection of 0.7% saline into the subarachnoid space without first removing the cerebrospinal fluid causes a rise in pressure in both the cerebrospinal cavity and the blood vessels. This rise is slow and is maintained for a comparatively long period. Clinically subarachnoid injection of adrenaline has no more influence than 0.7% saline. H. G.

**The action of some drugs on the sympathetic nerves of the heart.** J. TEN CATE. *Proc. Russ. Physiol. Soc.* 3, 5(1921); *Physiol. Abstracts* 7, 425; cf. C. A. 16, 2918.—Curare, cocaine, morphine, and urethan are found to paralyze the sympathetic nerve.  $\text{CHCl}_3$ , chloral hydrate, ether, and tincture of convallaria majalis act directly on the heart. The stimulation of the sympathetic nerve of a heart which is depressed by a drug of the second group produces an acceleration and an augmentation of its beats. Stimulation of the sympathetic accelerates the idioventricular heart-beat. Frogs were used. H. G.

**Action of sodium citrate on the coagulation of blood.** G. LEONE. *Rif. med.* 38, 313-4(1922); *Physiol. Abstracts* 7, 492.—While oral administration of as much as 1.2 g. of Na citrate per kg. bodyweight does not affect the clotting time of blood, this was almost doubled an hour and a half after subcutaneous injection of citrate, and remained high in value for 24 hrs. One g. of citrate given intravenously is sufficient to make the blood immediately incapable of clotting. H. G.

**The action of acid solutions of cane sugar on the secretion of trypsinogen.** B. P. BABKIN AND V. V. SAVICH. *Russ. J. Physiol.* 3, 143-7(1921); *Physiol. Abstracts* 7, 432.—The pancreatic juice secreted on introduction of acid into the stomach is poorer in trypsinogen than that secreted on giving meat or carbohydrates. Addn. of cane sugar to the acid (0.15 to 0.25% HCl) increases the concn. of trypsinogen in the pancreatic juice (Mett's method). The increase in trypsinogen does not depend on the act of feeding, since the acid sugar soln. was injected directly through a gastric fistula. H. G.

**The action of products of metabolism upon the growth of experimental sarcoma in rats.** E. I. KONEVSKAIA. *Russ. J. Physiol.* 3, 192-205(1921); *Physiol. Abstracts* 7, 457-8.—Injections of indole in 2 expts. produced a retardation of the growth of the tumor, in 1 expt. an acceleration. Skatole considerably accelerated its development.

Guanidine, hippurates, and creatinine somewhat accelerated the growth, but creatine produced a small retardation. H. G.

**Experiments on the coronary vessels of the human heart.** S. P. SAVADSEIT. *Russ. J. Physiol.* 3, 219–30 (1921); *Physiol. Abstracts* 7, 424.—The human heart was cut out 3 to 27 hours after death, and the coronary vessels were then perfused with oxygenated Ringer solution at body temperature. Adrenaline (concs. 1 to 2 in a million) was without any effect upon the coronary vessels. Histamine (1:500,000) produced a considerable vasoconstriction. Nicotine (1:5000) and  $\text{BaCl}_2$  (1:5000) had the same action. Strophanthin (1:100,000), camphor (1:2500) and caffeine (1:1000 to 1:10,000) produced vasodilation. If the human heart is perfused through one coronary artery only, the part supplied by this artery begins to beat alone, so it is possible to have the left or right heart beating separately. All the expts. with the coronary vessels were performed on hearts previously stopped by perfusion with strophanthin. H. G.

**The influence of carnosine and of different ions on pepsin.** I. A. SMORODINTSEV. *Russ. J. Physiol.* 4, 103–33 (1922); *Physiol. Abstracts* 7, 431.—Free carnosine inhibits the peptic digestion of edestin and caseinogen; 0.012% of carnosine is effective. The action of carnosine is weaker than that of  $\text{NaOH}$  and stronger than that of bicarbonates and phosphates. The action of diff. alkalis was compared; it was found that their inhibitory effects on peptic digestion are wholly explained by the presence of  $\text{OH}$ , the anion being of no significance; 0.1 *N* solns. of the salts of strong acid and strong base as well as of carnosine salts have no effect. H. G.

**Effect of radioactivity on the heart.** J. P. ZWAARDEMAKER. *Thesis Utrecht* 1922; *Physiol. Abstracts* 7, 426.—The hearts of lampreys, eels, and tortoises were perfused *in situ* with Ringer soln. in which K was replaced by uranyl nitrate, Th nitrate, or Ra emanation. The laws of equiradio-activity and of the radio-physiological antagonism are proved to be true. The diffusible K being washed out, all parts of the heart come to a standstill at the same time. All parts recover at the same time when the deficit is rectified. The tempo and the cond. are governed by the active quantity of radiation. The cond. is the same in  $\alpha$  and  $\beta$  automaticity. Passing from  $\alpha$  to  $\beta$  automaticity or *vice versa* irregularities in conduction occur, and now and then extra systoles. The occurrence of a complete paradox (stoppage of all parts of the heart) depends on the antagonizing quantities of  $\alpha$  and  $\beta$  rays. The lamprey shows sometimes a sino-ventricular rhythm. U causes an augmentation of tonus in the heart which is prevented by 1:60,000 novocaine. The elec. excitability (of the beating heart) is subject to the influence of radioactivity. The elec. irritability (of the apex cordis) is not, or the radio-activity of the depot suffices to maintain that irritability. Mech. excitation of the eel heart *in situ* gives extra systoles or fibrillations of the heart both in U and K automaticity. Passing from  $\beta$  to  $\alpha$  automaticity the vagus effect in response to the same stimulation diminishes. The chronotropic effect is lost first, afterwards the inotropic. Automaticity, cond., and excitability depend on the presence of a certain amt. of radio-activity. The force of the muscle and the irritability of the apex do not depend on it. For a vagus effect in eel and tortoise a certain amt. of K is needed. H. G.

**Clinical experience with quinidine.** C. S. BURWELL, AND F. R. DIEUAIDE. *Arch. Intern. Med.* 31, 518–26 (1923).—Of 16 cases of auricular fibrillation treated with quinidine sulfate, 14 reverted to normal mechanism, 8 apparently permanently (6 over 6 months). There were 3 deaths. Autopsy was denied in one, auricular thrombus was found in another and thrombus of the central cerebral artery in the third.

I. GREENWALD

**Metabolism of inorganic salts. II. Inorganic ion ratio after administration of oxalates and citrates.** E. G. GROSS. *J. Biol. Chem.* 55, 729–38 (1923); cf. C. A. 16, 3963.—The subcutaneous administration of 0.5 g.  $\text{Na}_2\text{C}_2\text{O}_4$  per kg. to dogs produced tetany, with a decrease in Na, Cl and Ca and increase in total P and K of the whole blood. Na and Cl increase in about the same proportion; and K and P show a parallel increase. The injection of 1 g. Na citrate per kg. failed to produce tetany or any change in blood salts. I. GREENWALD

**Chemical constitution and pharmacological action.** G. JOACHIMOGLU. *Z. angew. Chem.* 36, 93–4 (1923).—Comparison of the action of drugs and their chem. and phys. properties seems to demonstrate a close connection so that the action should often be predicted from the constitution of the compd. This is true only in a limited sense and for a few series of compds. As, Te and Se compds. of the higher valence are weaker than those of low valence. Quinine compds. have their toxicity to trypanosomes increased by hydration but strychnine and other alkaloids are weakened by hydration.  $\text{NMe}_6$  bases act similarly to curare. The chloride of the tertiary base has no such action but  $\text{NMe}_4$  and  $\text{NEt}_4$  salts have the curare action. The corresponding compds. of As,



Sb, P and S show a curare-like action. Basic compds. of a certain compn. exhibit the same effects independently of the metal element but this same action may follow administration of substances of entirely different compn. The phys. properties, as soly., are highly important in their effect on pharmacol. action. With sufficient facts one may ultimately obtain a clear view of the situation.

H. C. HAMILTON

**Hemolytic and coagulating effect of metal ions.** E. MENEGBETTI. *Biochem. Z.* 131, 38-77(1922).—Continuation and repetition of previous studies (*C. A.* 17, 1508). The hemolytic and coagulating effects of Ag, Hg and Pb salts mixed with NaCl, NaI, NaBr,  $\text{Na}_2\text{S}_2\text{O}_3$  or  $\text{KNO}_3$  are described and the numerical results tabulated. The effects in general are related to ion concn. of the salts used, the temp., the sp. activity of the metal ion and the particular properties of the salt being studied in relation to the mixt. employed. The physicochem. processes of coagulation are the 1st to appear; at high concn. this may occur so rapidly that a sudden coagulation of the blood cells occurs; at lesser concns. the reaction is less rapid, hemolysis occurs and the end result is a coagulation of the split products of the blood corpuscle residues. At low concns. the hemolysis is followed by an increase in the viscosity and at still lower concns. hemolysis alone occurs. Further expts. indicate that the metal is present in the corpuscle as the ion and that coagulation is an ion protein adsorption product.

F. S. HAMMETT

**Large doses of trypaflavine (acriflavine) in cases of endocarditis.** H. MARK AND L. OLSKER. *Deut. med. Wochschr.* 49, 17(1923).—Trypaflavine can be injected intravenously, in quantities far in excess of those usually employed. The most useful dosage is 0.01 g. per kg. body wt. The calcd. total amt. should be dissolved in 20 cc. of distd. water and injected (arm vein) very slowly. Extravasation is to be carefully avoided. The customary total dose is 0.8 g., but 2.0 g. was given in one case without deleterious effect. The cases of endocarditis so treated made remarkable recoveries.

MILTON HANKE

**Experiences with Rivanol, in particular concerning its use in cases of diffuse peritonitis.** M. KATZENSTEIN AND FR. SCHULZ. *Klin. Wochschr.* 1, 513-5(1922); cf. *C. A.* 17, 1528.—Rivanol was used in a large number of severe local infections with excellent results. The Rivanol soln. was injected into and around the infected area, or in some cases of open infections, the antiseptic liquid was used as a wash. Cases of joint infection were successfully treated. This prepn. seems to have no injurious action on normal tissue. The usual procedure in peritonitis was to remove the pus as far as possible mechanically with sterile salt soln., introduce 1-200 cc. of a Rivanol soln. into the peritoneal cavity and seal the abdomen without drainage. Of 13 cases of peritonitis due to a ruptured appendix, there were no fatalities by this method. Rivanol is to be used cautiously in cases with nephritic tendencies.

M. H.

**Action of some drugs on the blood vessels. Studies with the capillary microscope.** O. MOOG AND W. AMBROSIVS. *Klin. Wochschr.* 1, 944-7(1922).—Adrenaline, 0.5 to 1.0 cc. injected intramuscularly, leads to a constriction of the arterial end of the capillary vessels. In consequence the rate of blood flow is greatly reduced; the blood has a granular appearance. An entirely similar picture is obtained in certain cases of hypertension without the action of adrenaline. Adrenaline constricts only those vessels through which a flow of blood is maintained. Capillaries that have been injured through an O deficiency and an accumulation of  $\text{CO}_2$  show a reduced sensitiveness to the action of adrenaline. Adrenaline is not destroyed by tissue. When it is injected into a temporarily congested area and allowed to remain there for 20 minutes, a max. effect develops as soon as the circulation is reestablished. Papaverine transiently reduces the blood pressure in certain cases of hypertension and, in this way, facilitates blood flow through the capillaries. The capillary vessels are not dilated. The action of nitroglycerin is like that of papaverine, but may last for 2.5 hrs. The Na salt of veronal has an action like that of papaverine. Atropine, in therapeutic doses, is without effect.

MILTON HANKE

**Effect of ether introduced into the great serous cavities. I. Contribution to the pathological physiology of the pleura and the peritoneum.** L. TORRECA. *Arch. sci. biol.* 2, 473-500(1921); *Physiol. Abstracts* 7, 62.—Intraperitoneal injection of 1 g. per kg. of  $\text{Et}_2\text{O}$  into dogs produces one narcosis; intrapleural injection causes death because of rapid absorption. The presence of  $\text{Et}_2\text{O}$  in serous cavities causes changes in the contained organs, chiefly hemorrhage due to thrombosis, followed later by adhesions.

JOSEPH S. HEPBURN

**Action of chloroform on the coagulation of blood plasma.** P. NOLF. *Bull. sci. acad. roy. Belge* [5] 7, 71-99(1922); *Physiol. Abstracts* 7, 27.—Serum, obtained from bird blood by coagulation with  $\text{CHCl}_3$ , exerts a rapid and intense coagulating action upon bird plasma; its thrombin is permanent for a long time even at a temp. of  $37^\circ$ .  $\text{CHCl}_3$

also completely coagulates oxalated plasma, and confers on serum, obtained by spontaneous coagulation of plasma, the power to coagulate bird plasma rapidly. Under the influence of  $\text{CHCl}_3$ , plasma, which has been heated to a temp. of  $65^\circ$ , can exert a slight coagulating action on a stable plasma, and on a soln. of fibrinogen. Oxalated plasma, treated with  $\text{Ca}_3(\text{PO}_4)_2$ , then with  $\text{CHCl}_3$ , contains more antithrombin than either oxalated plasma or plasma treated with the phosphate only; the  $\text{CHCl}_3$  apparently cannot exert its direct destructive action on the antithrombin. When antithrombin disappears under the influence of  $\text{CHCl}_3$ , it is destroyed during the coagulation of the plasma.

JOSEPH S. HEPBURN

**Report on alfalfa with clinical cases.** S. K. HALL. *Hahnemannian Monthly* 58, 312-4 (1923).—A detailed account of the physiol. action of alfalfa when administered as the tincture.

JOSEPH S. HEPBURN

**Study of the effects of Cucurbita pepo seeds on kidney excretion.** BENJAMIN MASUROVSKY. *Proc. Nat. Acad. Sci.* 8, 39-43 (1922); cf. *C. A.* 15, 3304.—Ingestion of either raw or roasted seeds of the pumpkin (*Cucurbita pepo*), in amts. ranging from 30 to 65 g. daily, produced a decrease in the total vol. of urine excreted in 24 hrs. and in its total solids.\* The seeds caused an increase in the daily excretion of urea, uric acid, and indican.

JOSEPH S. HEPBURN

**Diuretic action of allyltheobromine.** C. HEYMANS. *Le Scalpel* 74, 592-6 (1921); *Physiol. Abstracts* 6, 332 (1921).—Allyltheobromine by itself is an antihypertropic even in nephritis. Its diuretic action is especially marked when it is administered with digitalis to patients showing cardiac symptoms and edema.

JOSEPH S. HEPBURN

**The influence of the carbon dioxide content of inspired air on breathing and the gas metabolism.** HERMANN ILZHOFER. *Arch. Hyg.* 89, 223-36 (1920).—A relatively small increase of  $\text{CO}_2$  in the inspired air causes an increase in the vol. of respiration which goes parallel with the increase in  $\text{CO}_2$ . This increase in vol. is the same whether the  $\text{CO}_2$  is pure, is from expired air or from combustion, showing the  $\text{CO}_2$  alone is responsible for the increased respiration. The frequency of respiration and the depth are not influenced by a  $\text{CO}_2$  rich atm.; the  $\text{CO}_2$  tension is increased but the O tension is only immaterially raised. The  $\text{CO}_2$  excretion and O consumption are unmistakably but slightly increased. The increase in O consumption is parallel with the decrease of  $\text{CO}_2$  excretion and is caused by it. The O consumption increase is not influenced by the source of  $\text{CO}_2$  and is the result of changes in the physical relations in the blood.

JULIAN H. LEWIS

**Adrenaline and the white blood cells.** FR. O. HESS. *Munch. med. Wochschr.* 68, 1668 (1921); *Deut. Arch. klin. Med.* 141, 151-64 (1922).—The nature of the lymphocytosis produced in various diseases after the injection of adrenaline is studied and theories as to the cause of the lymphocytosis are discussed.

JULIAN H. LEWIS

**The anesthetic action of pure ether.** H. H. DALE, C. F. HADFIELD, AND H. KING. *Lancet* 1923, I, 424-9.—No support was obtained for the statements that pure ether is devoid of anesthetic properties. Purification enhanced the anesthetic action, and removed respiratory irritants. "Ethanosal," which consisted essentially of ether plus 4% normal BuOH and a small quantity of an aldehyde, owed its anesthetic properties solely to the ether.

E. R. LONG

**The treatment of chronic intestinal stasis by colloidal kaolin.** A. C. JORDAN. *Lancet* 1923, I, 432-4.—Colloidal kaolin is an adsorbent for intestinal toxins, and hence a valuable therapeutic agent in intestinal stasis. It also has a useful mech. action on the large intestine. A dessert-spoonful of the powder is taken in hot water twice a day.

E. R. LONG

**The effect of histamine on the human gastric secretion.** A. R. MATHESON AND S. E. AMMON. *Lancet* 1923, I, 432-3.—Histamine in small doses given subcutaneously excites a flow of gastric secretion in man. The peptic activity of the juice increases after histamine injection, reaching its max. in about 5-15 min. Both total and free HCl increase, reaching their max. shortly after the pepsin max. is registered. Doses of 1.5 mg. of ergamine acid phosphate do not produce any harmful gastric or general disturbance and may be employed as a means of investigating the state of gastric secretory function and perhaps as a therapeutic agent.

E. R. LONG

**The influence of Korean ginseng on metabolism.** S. INADA AND J. TAKAMIZU. *Japan Med. World* 2, 343 (1922).—When large amts. of ginseng are ingested there is a slight increase in the amt. of body protein cleavage, but not enough to cause a loss in body weight. Also, the output of urine is temporarily increased, but it is soon decreased markedly. The concn. of the urinary constituents is not decreased.

M. E. MAVER

**The action of salicylic acid and quinine on the auditory nerves.** F. TANAKA. *J.*

Okayama Med. Soc. No. 394(1922); *Japan Med. World* 3, 52(1923).—T. observed dissolution of Nissl's bodies in the auditory nerves, and remarkable changes in the spinal ganglion cells after the administration of these drugs for a long time. The changes were detected by vital fixation with 96% alc.

M. E. MAVER  
**Behavior of hydroxybenzoic acid in the animal body.** Z. OHTANI. *J. Osaka Med. Soc.* 21, No. 11(1922); *Japan Med. World* 3, 51(1923).—Moderate amts. of salicylic acid, *m*- and *p*-hydroxybenzoic acids increase the N secretion of the urine, but a large amt., especially of salicylic acid, diminishes the N secretion. They all increase the reducible matter in the urine. *p*- and *m*-Hydroxybenzoic acids always increase the ether-sulfuric acid content of the urine while salicylic does not. They are also more toxic to the rabbit than salicylic acid. The dihydroxybenzoic acids all increase the N content of the urine. These acids are much less toxic than the monohydroxybenzoic acids.

M. E. MAVER  
**The formation of hemoglobin.** S. HIRASAWA. *J. Osaka Med. Soc.* 21, No. 9 (1922); *Japan Med. World* 3, 36(1923).—Tryptophan effects a very rapid improvement in exptl. anemia of the rabbit, which is probably due to the formation of the pyrrole nucleus of the hemoglobin mol. Inorg. Fe preps. also effect an improvement in a more chronic form of exptl. anemia, although tryptophan serves better. A combination of these two substances is recommended. Histidine alone does not improve anemia. Tryptophan does not change the hemoglobin content nor the erythrocyte count in normal animals.

M. E. MAVER  
**The relation between spasm and adrenaline.** T. AIYA. *J. of Ped. (Japan)* No. 268(1922); *Japan Med. World* 3, 53(1923).—Questioning the view held by previous workers that infantile tetany is partly due to the abnormally augmented function of the suprarenal capsules, thyroids, etc., A. injected adrenaline in 60 cases of ekiri and dysentery. Spasm occurred in some, while in many it produced no symptoms. The change in the suprarenal capsule is by no means an important factor in the development of spasm.

M. E. MAVER  
**Cholate treatment of tuberculosis.** S. TANAKA. *J. Tuberculosis (Japan)* 3, No. 5(1922); *Japan Med. World* 3, 55(1923).—Since (1) the bacterial toxin has a special affinity for benzoic and salicylic acids, and (2) there is a substance in the lipidal constituents of the tubercle bacilli which has an astringent action on tuberculous foci, T. treated the bacillary powder with benzyl cholate and ether. The crystal thus obtained was treated further with salicylic acid or benzoic acids. The crystals had a strongly astringent action on tuberculous foci when used in the treatment of tuberculosis.

M. E. MAVER  
**Lesions of gastric glands produced by experimental intoxication with pilocarpine and with atropine-pilocarpine.** H. DORLENCOURT AND H. LEMAITRE. *Compt. rend. soc. biol.* 87, 1186-8(1922).—Intravenous injections of pilocarpine into a rabbit in relatively weak doses rapidly caused the following lesions in the glandular cells: a very pronounced fatty degeneration of the border cells, plasmolysis of the chief cells following an initial hyperplasia, abrasion and casting off of the epithelial lining. The pilocarpine, thus, exercises a toxic effect causing rapid fatty degeneration and the disappearance of the mitochondria in the lining cells and an excitation with hyperplasia of the chief cells. The antagonistic action of the atropine is shown also in the histological reaction, the combined injection of atropine and pilocarpine producing practically no recognizable cellular changes.

S. MORGULIS  
**Treatment of experimental trypanosomiasis with hydroxyaminophenylarsenic acids.** E. FOURNEAU AND A. NAVARRO-MARTIN. *Compt. rend. soc. biol.* 87, 1197-9 (1922).—Of the 10 possible isomers of the hydroxyaminophenylarsenic acids 6 were subjected to exptl. tests as regards max. tolerable dose, curative dose and the chemotherapeutic coeff. The most active compd. is *p*-hydroxy-*m*-aminophenylarsenic acid, and the least active are 3-hydroxy-2-aminophenylarsenic and 4-hydroxy-2-aminophenylarsenic acids. These arsenical derivs. thus show a very marked specificity.

S. MORGULIS  
**Therapeutic action of essential oils in diseases of the respiratory organs.** C. GATTI AND R. CAYOLA. *Riv. Ital. ess. profum.* 4, 77-82(1922); *Chimie et industrie* 9, 327 (1923); cf. *C. A.* 16, 3731.—The following oils in decreasing order of efficiency have a therapeutic value: eucalyptus, pine, myrtle, myrrh, violet, basil, angelica, thyme. A few formulas for sirups, etc., are given.

A. PAPINEAU-COUTURE  
**Röntgenography of urinary tract during excretion of sodium iodide.** E. D. OSBORNE, C. G. SUTHERLAND, A. J. SCHOLL AND L. G. ROWNTREE. *J. Am. Med. Assoc.* 80, 368-73(1923).—It is possible to obtain röntgenograms of the urinary tract during the excretion of NaI following its intravenous or oral administration. L. W. RIGGS

**Carbon tetrachloride in the treatment of hookworm disease.** S. M. LAMBERT. *J. Am. Med. Assoc.* 80, 526-8(1923); cf. *C. A.* 17, 594.—Pure  $\text{CCl}_4$  is the best vermifuge for hookworm; 3 fatalities out of 50,000 are ascribed to impurities. Where there is a heavy infection of *Ascaris* the results are improved by the addition of oil of chenopodium.

L. W. RIGGS

**Influence of phlorhizin on intestinal absorption.** FUSAKICHI NAKAZAWA. *Tohoku J. Exptl. Med.* 3, 288-94(1922).—The expts. were made with rabbits. Phlorhizin retards the absorption of glucose but has no action on water, salt, protein or fat. The unabsorbed glucose limits the absorption of water by offering osmotic resistance. This action appears to cause the diarrhea observed after the ingestion of large amts. of phlorhizin. It is presumed that phlorhizin acts the same way on absorption in the renal tubules, i. e., it would retard the absorption of glucose by its sp. action on the tubules, while that of water and chlorides remain unaffected, except through the osmotic pressure of the unabsorbed glucose, which retains some water. This presumption agrees with the fact that the urine during the phlorhizin glucosuria shows a moderate increase in water, but no significant change in its other components.

L. W. RIGGS

**Effect of anticoagulants on the observed values of the oxygen capacity of blood estimated by the ferricyanide method.** MATAJURO YAMAKIYA. *Tohoku J. Exptl. Med.* 3, 305-16(1922).—In an amt. larger than 0.15% concn. to the ammonia water the addn. of  $\text{K}_2\text{C}_2\text{O}_4$  diminishes the values of the O capacity of human blood observed by the ferricyanide method. In the case of rabbits this effect is produced by an amt. larger than 0.2% concn.  $\text{Na}_2\text{C}_2\text{H}_3\text{O}_2$  has a similar effect but is less marked than  $\text{K}_2\text{C}_2\text{O}_4$ . It produces a recognizable decrease in the observed value of the O capacity of blood in a concn. greater than 0.75% to the ammonia water. The influence of these salts on the O capacity is due to their checking action on the laking of blood. There are individual variations in the action of these salts partly owing to the individual differences of the resistance of the plasma membrane of red corpuscles. **Gaseous metabolism and blood flow of the brain.** I. Under narcosis and hypnosis. *Ibid* 414-95.—Rabbits were employed in this study. The O used in the brain was measured by means of a Barcroft differential blood gas app. which detd. the difference between the amts. of O in 1 cc. of blood entering and in 1 cc. of blood leaving the brain. The actions of  $\text{Et}_2\text{O}$ ,  $\text{CHCl}_3$ , morphine, pantopon, scopolamine and scopolamine-morphine, Mg, Ca,  $\text{CCl}_4$ ,  $\text{CH}(\text{OH})_3$ , paraldehyde, urethan, Na veronal, Na luminal and  $\text{EtOH}$  were studied during the various stages of narcosis with special reference to the brain circulation. Exptl. data fill 18 tables and the conclusions occupy 3.5 pages. II. Effect of excited activity of the brain on its oxygen consumption and blood flow, and the action of drugs on the cerebral vessels. *Ibid* 496-537.—The expts. were made with rabbits. Excitement of the brain causes an increase in the O consumption accompanied by the increased cerebral blood flow. When the excitement produced by stimulants is marked, the increased O consumption is greater than the increased blood flow. Strychnine caused an av. increase in O consumption of 87.7%. When the excitement is not pronounced, the cerebral O consumption follows the change in the blood flow, as with antipyrine. Atropine increases somewhat the O consumption without a notable change in the cerebral blood flow, while nicotine produces, after a primary increase, a decrease in the latter. Among drugs acting on blood vessels, strophanthin gives rise to a slight diminution of both blood flow and O consumption. With quinine and yohimbine no appreciable effect was found. Thyroprotein was without effect. Pituitrin caused such a marked decrease in the cerebral blood flow that the collection of blood samples was scarcely possible, while the arterial blood pressure was decidedly raised and the O consumption was less reduced than the blood flow. Adrenaline caused decreased consumption of O in spite of the increased blood flow. While antipyrine accelerates both factors the combination of antipyrine with caffeine had no special effect. Under stimulants, drugs acting on blood vessels and organ preps., the cerebral blood flow is sometimes influenced by changes in the blood pressure, but in most cases it alters independently of changes in the blood pressure, heart beat, respiration and muscular movement of the animal. When any drug is administered to the animal, there are 3 mechanisms controlling the blood flow through the brain: (1) the specific action of the drug on the cerebral vessels, (2) its effect on the general blood pressure, and (3) the actions of the metabolic products by changes in the brain activity. Each of these may act alone or in combination. III. Effect of cold and hot applications to the head on the gaseous exchange of the brain. *Ibid* 538-55.—*In vitro* the reduction of oxyhemoglobin is much accelerated by a rise in temp. Cold ( $1^\circ$  to  $3^\circ$ ), applied to the head of the rabbit, frequently but not always caused a decrease in the cerebral blood flow. A hot application ( $45^\circ$  to  $50^\circ$ ) always increased the blood flow without changing the arterial

blood pressure. The cold and hot applications change the temp. of the brain surface about  $3^{\circ}$  to  $3.5^{\circ}$ . The renewal of the initial temp. after the removal of a hot application is generally more prompt than in the case of a cold one. With a cold application to the head, O consumption is generally increased however the blood flow may be changed. O consumption is also increased by hot applications even if the blood flow remains unaltered. **IV. Relation of the blood flow to the oxygen consumption in the brain.** *Ibid* 556-66.—The O consumption in the brain is influenced by the cerebral blood flow; the rate of change in the former is less than that in the latter. This is in part an indirect effect of changes in the activity of the brain due to the altered blood flow. As the O consumption in the brain becomes less closely related to the blood flow, the more distinct the changes in the activity of the brain. In the order of O requirements of tissues, the cerebral tissues should be regarded as a special class independent of muscular, glandular and connective groups. In the brain of the rabbit, the O used per g. per min. averages 0.0944 cc. It is markedly larger than that in other tissues. The av. difference between the O contents of the arterial and venous bloods in the rabbit's brain is 6.92 cc. per 100 cc. of blood in 185 animals. **Internal secretion and gaseous exchange of blood.** *Ibid* 567-607.—The O loss of normal non-nucleated red corpuscles stored in the ice chest at  $4^{\circ}$  to  $7^{\circ}$  ranges from 50 to 80% in 70 to 80 hrs., but if mixed with adrenaline the O loss ranges from 15 to 40% in the same time. If stored in the incubator at  $34^{\circ}$  to  $38^{\circ}$  the loss of O is 80 to 100% in 15 to 50 hrs. but in the presence of adrenaline the decrease is 50 to 60%. Generally the influence of adrenaline on  $\text{CO}_2$  production is greater than that on O consumption. In blood with or without adrenaline, O consumption and  $\text{CO}_2$  production do not run closely parallel to each other; even after the entire loss of O the production of  $\text{CO}_2$  can continue. Adrenaline has no influence on the O capacity of the blood. When the blood is hemolyzed the time taken for complete reduction is shortened, and by storage in the incubator for 10 hrs. the O is entirely lost, while if adrenaline is added, the reduction of blood is retarded, and is nearly the same as that for non-hemolyzed normal blood. Adrenaline has no relation to the serum, cell membrane, cell structure or stroma of the red corpuscles. The inhibitory action of adrenaline soln. on the gaseous metabolism of blood is not due to chlorotone contained in it, nor is it due to its acidity. HCl of the same acidity increases the rate of reduction of blood. Adrenaline also retards the rate of reduction of blood when it is treated with reducing gas. When the blood is reduced with  $\text{CO}_2$  gas the effect is more marked than when  $\text{N}_2$  gas is used. Adrenaline does not accelerate the rate of oxidation but has a tendency to retard it. For a few min. after the intravenous injection of adrenaline, just during the rise of the blood pressure, the blood of the external jugular vein is red colored and contains nearly as much O as arterial blood. This action of adrenaline has no relation to the state of the blood flow. If blood is taken within a few min. after the intravenous injection of adrenaline, the gaseous exchange *in vitro* is much decreased. By the direct inhibitory action of adrenaline on the reduction of oxyhemoglobin, the O supply to tissues and organs is disturbed, and there may occur anoxemia, which is further increased by constriction of the blood vessels. The inhibitory effect of adrenaline on the gaseous exchange of blood has no relation to white corpuscles, blood platelets or fibrin. Adrenaline and asphyxia produce many similar effects and phenomena in the body; some of the phenomena are explained by the anoxemia provoked by it. Pituitrin and thyroprotein have no similar effect on the gaseous metabolism *in vivo* or *in vitro*.

L. W. RIGGS

**Clinical and experimental anoxemias and the effect of oxygen administration.** MATAJURO YAMAKITA AND TOYOJIRO KATO. *Tohoku J. Exptl. Med.* 3, 608-52(1922).—Arterial unsatn. in 10 normal adult persons and in 24 clinical cases was reduced by O inhalations except in cases of heart disease with decompensation when little benefit was received. With rabbits the efficacy of O inhalation on anoxemia is distinct even in the case of the nearly ceased heart beat with still continuing respiratory movement, also in apneic conditions with heart beat provided the ventilating surface of the lung is comparatively intact. Neither hypodermic injection of O nor intravenous injection of  $\text{H}_2\text{O}_2$  had any effect on the anoxemia. In anoxic states O changes the respiration but slightly in spite of its prompt effect on arterial O unsatn. Failure of circulation in pharmacological poisoning could not be relieved by O inhalation. O should be administered as an inhalant for a prolonged time and repeatedly in anoxic conditions.

L. W. RIGGS

**Magnesium sulfate as a sedative.** P. G. WESTON AND M. Q. HOWARD. *Am. J. Med. Sci.* 165, 431-3(1923).—Pure, sterile  $\text{MgSO}_4$  given by subcutaneous or intramuscular injection has a prompt sedative action which lasts 5 to 10 hrs. G. H. S.

**Effect of quinine on auricular fibrillation. A therapeutic paradox.** S. NG BOER.

*Arch. expul. Path. Pharm.* 94, 314-26(1922); cf. *C. A.* 16, 3698.—Quinine or quinidine is beneficial in all cases. G. H. SMITH

**Mechanism of adrenaline hyperglucemia. I. Changes in the  $p_H$  of the blood of the portal vein and the vena hepatica.** A. GOTTSCHALK AND E. POHLE. *Klin. Wochschr.* 1, 1310-1; *Arch. expul. Path. Pharm.* 95, 64-74(1922).—The intravenous or subcutaneous injection of adrenaline in rabbits in doses sufficient to give a hyperglucemia causes a significant rise in the  $p_H$  of the portal vein and the hepatic vein, particularly in the latter. The increase in blood sugar appears earlier after the injection than does the change in reaction of the blood in the portal vein. At the end of the 4th hr. the  $p_H$  of the portal blood is almost returned to normal, while the blood sugar still remains above normal. **II. Relation between the changes in the  $p_H$  of the blood of the liver and the hyperglucemia.** *Ibid.* 75-92.—Ligation of the portal vein results, when the ligature is removed, in a hyperglucemia and an increase in the  $p_H$ . Inhibition of hyperglucemia from adrenaline injection is effected by ligation of the vein. The oral introduction of alkali lessens the hyperglucemia but does not materially affect the  $p_H$  of the blood. It appears then, that adrenaline hyperglucemia is directly or secondarily an effect of the altered  $p_H$  of the blood and tissue fluids. G. H. SMITH

**Effect of strychnine on the senses, particularly on vision.** ERWIN SCHLACINTWIRT. *Arch. expul. Path. Pharm.* 95, 104-23(1922).—The size of the visual field is not increased by strychnine, nor is the sharpness of sight, central or eccentric, intensified. Color sensitivity, for white or other colors, is not modified. The other senses are equally unsuceptible to alteration by administration of strychnine. G. H. SMITH

**Pharmacology of body position and labyrinthine reflex. VIII. Intoxication with cinchona ketones with particular reference to rolling movements.** U. G. BIJLSMA AND C. VERSTEEGH. *Arch. ges. Physiol.* (Pflüger's) 197, 415-23(1922).—Quinine and hydroquinone administered to mice and guinea pigs cause marked motor disturbances of the heart, cramps, opisthotonos, and other effects, with from time to time a rolling motion always following rotation of the head. The manifestations of the intoxication resemble those changes following unilateral labyrinth extirpation. The labyrinth is not essential for the rolling motion; the disturbance is central. With increasing intoxication the position reflex and the compensatory ocular adjustments are lost. G. H. SMITH

**Action of contracting substances (chloroform, sodium hydroxide, hydrochloric acid, pelletierine, etc.) upon the smooth musculature of the leech.** YUTAKA SAITO. *Arch. ges. Physiol.* (Pflüger's) 198, 191-214(1923).—In satd. soln.  $\text{CHCl}_3$  always causes a strong contraction; the temp. coeff. is negative.  $\text{NaOH}$  in strong solns. also always induces a strong contraction, often resembling that of striated muscle. Lower concns. lead to contraction with more or less regular rhythmic waves. The temp. coeff. is positive. With muscle preps. of relatively slight tonus  $\text{HCl}$  in active concns. leads to contraction, usually similar to that of striated muscle. With muscles of high tonus  $\text{HCl}$  always causes relaxation. The muscle is still susceptible to elec. stimuli and  $\text{CHCl}_3$  contraction after this loss in tonus.  $\text{HCl}$  neutralizes, at least partially, the contraction due to  $\text{NaOH}$ , but  $\text{NaOH}$  causes a further shortening when used after  $\text{HCl}$ . The simultaneous application of  $\text{NaOH}$  and  $\text{CHCl}_3$  or  $\text{HCl}$  and  $\text{CHCl}_3$  is more effective than  $\text{CHCl}_3$  alone. Pelletierine reacts upon the tonus of the whole animal and causes an intense contraction of isolated muscle. This effect is intensified by  $\text{NaOH}$  or  $\text{CHCl}_3$ ; elec. stimuli or  $\text{HCl}$  neutralize the action. Pelletierine contracts the guinea-pig uterus, and this contraction is removed by treatment with  $\text{HCl}$ , although on the fresh prep.  $\text{HCl}$  itself induces a contraction.  $\text{HCl}$  is without effect upon the contractions of the leech muscle induced by nicotine, cocaine, or novocaine. G. H. S.

**Action of phenol-camphor in joints.** ANDREAS HEDRI. *Arch. klin. Chir.* 122, 281-313(1922).—Phenol-camphor has been utilized in the treatment of joint infections without pathol. effects upon the tissues. G. H. SMITH

**Action of calcium on the vegetative nervous system.** WALTHER USENER. *Z. Kinderheilk.* 27, 262-87(1920-1).—Children were given  $\text{CaCl}_2$  in 1-g. amts. for 4 doses at 2-hr. intervals and then pilocarpine, atropine, or adrenaline was injected subcutaneously. The preliminary treatment with  $\text{Ca}$  did not interfere with the action of either pilocarpine or atropine. The glucosuria which usually follows the injection of small amts. of adrenaline was inhibited.  $\text{Ca}$  exerted a similar effect in rabbits, antagonizing adrenaline and diuretin glucosuria. Phlorhizin glucosuria is unaffected by  $\text{Ca}$ , as is alimentary glucosuria also.  $\text{Ca}$  in the amts. used does not interfere with sugar elimination by the kidney. Most probably the  $\text{Ca}$  exercises its effects upon the nervous system. G. H. S.

**Influence of subcutaneous saline injections upon the chlorine and nitrogen of the**

blood and upon the temperature of infants. KURT SCHEER. *Z. Kinderheilk.* 31, 290-2(1922).—The failure of Stoltenberg to confirm the findings of the author, viz., that the blood Cl is related to digestion activity, is ascribed to difference in the technique employed. To this, STOLTENBERG replies (*Z. Kinderheilk.* 32, 246(1922)) without adding anything material to the discussion. Cf. *C. A.* 16, 3132. G. H. S.

**Narcosis. I. Action of narcotics on the permeability of muscle-fiber membranes.** H. LANGE AND B. W. MÜLLER. *Z. physiol. Chem.* 124, 103-22(1922).—See *C. A.* 16, 2916. **II. Ibid** 124, 140-58(1923).—The cause of narcosis in muscle does not consist in decreased or increased permeability of the muscle fiber membranes but in a diminution in the capacity to respond to influences tending to vary the permeability. Thus muscles previously subjected to the action of narcotics did not exhibit the greatly increased excretion of  $H_2PO_4$  which occurs after immersion in an isotonic soln. of sucrose. R. I. STEHLE

Hydrolysis of xanthylated derivatives of veronal and the hypnotics of the barbituric series; its importance in toxicology (FABRE) 17.

### I—ZOÖLOGY

R. A. GORTNER

**Influence of the specific gravity of hen eggs on fertility, hatching power and growth of chicks.** F. E. MUSSEHL AND D. L. HALBERSLEBEN. *J. Agr. Research* 23, 717-20\* (1923).—The av. sp. gr. of the whole eggs was 1.07 or 50% of that of the shell. The albumin which constitutes 10% of the total egg vol. had a sp. gr. of 1.31. The fat constituted 12% of the total vol. of the eggs and had a  $d_{100}$  of 0.881. Little correlation was found between the sp. gr., fertility, and hatchability of hen eggs. The sp. gr. bears no relation to the viability of the chick hatched or to its growth the first 5 weeks. Variations in the thickness of the shell are more likely to influence the sp. gr. of eggs than are variations in the protein or fat contents. F. C. COOK

**Copper: its occurrence and role in insects and other animals.** R. A. MUTTKOWSKI. *Trans. Am. Micr. Soc. (Menasha)* 40, 144-57(1921); *Abstracts Bact.* 5, 530.—Cu is found in insect blood in quantities comparable to that of crayfish blood. It is believed that it serves as the nucleus of a respiratory protein-hemocyanin. H. G.

**Quantitative investigations concerning the action of thyroxin, diiodotyrosine, iodothyroxine and iodothyreoglobulin.** BENNO ROMEIS. *Klin. Wochschr.* 7, 1262(1922).—Thyroxin, fresh thyroid gland, iodothyroxine, iodothyreoglobulin, and diiodotyrosine increase the rate of development of a tadpole, reduce the rate of growth, and increase the rate of catabolism. Of these, thyroxin is the most active. Thyroxin, which in this respect is at least 100 times as effective as diiodotyrosine, shows a definite activity in a concn. of 1:100,000,000. Although thyroxin, in minimal doses, is equally effective in augmenting the rate of development of young and old frog eggs, diiodotyrosine increases the rate of development, decreases the rate of growth, and increases the catabolic rate of very young *Rana temporaria* larvae at a concn. of 1:1,000,000; but is without effect, in this concn. on older larvae. A thyroxin concn. of 1:10,000,000 is as effective on old larvae, as a diiodotyrosine concn. of 1:10,000. MILTON HANKE

**Studies on bioluminescence. XV. Electroreduction of oxyluciferin.** E. N. HARVEY. *J. Gen. Physiol.* 5, 275-84(1923); cf. *C. A.* 16, 1465.—Oxyluciferin from *Cypridina* may be reduced to luciferin when an elec. current is passed through the soln. at cathodes formed at metal couples in soln. and at the cathodes of oxidation-reduction cells of the NaCl-Pt-Pt-Na<sub>2</sub>S type; also from metal surfaces (Al, Mn, Zn, Cd) which liberate nascent H from H<sub>2</sub>O, even though no visible H gas escapes from the metal surface. Mol. H does not reduce it except in contact with Pd. Pd is ineffective except in the presence of H and seems to act as a catalyst because of its power to convert mol. H into atomic H. Continuous luminescence of luciferin can be attained: (1) by a large palladinized surface which would continually reduce oxyluciferin, the latter being reoxidized with luminescence in the presence of luciferase and O; (2) by a palladinized surface in contact with oxyluciferin, luciferase and Na hypophosphite. The hypophosphite acts as an O acceptor; the Pd decomposes H<sub>2</sub>O, the O from which is taken up to form Na phosphite, while H<sub>2</sub> reduces the oxyluciferin. Luminescence should last as long as there is any hypophosphite and O left in the soln. The steady luminescence of bacteria is probably due to continuous oxidation of luciferin to oxyluciferin and the reverse reduction in different parts of the bacterial cell. The following methods of reduction in neutral soln. which might find a use in biochemistry are given: the soln. of Mg in NH<sub>4</sub> salts, whereby there is a rapid evolution of H and the formation of a

practically neutral double salt; the use of Al amalgam made by dipping Al shavings in 0.5%  $\text{HgCl}_2$  soln. Al amalgam dissolves in  $\text{H}_2\text{O}$  with the continuous formation of nascent H and insol.  $\text{Al}_2\text{O}_3$ .

CHAS. H. RICHARDSON

**Organ substances with specific action.** IX. EMIL ABDERHALDEN AND OLGA SCHIFFMANN. *Arch. ges. Physiol.* (Pflüger's) 198, 128-44(1923); cf. *C. A.* 17, 833.—The development of tadpoles is not modified by the thyroid treatment of the frogs before spawning or by the treatment of the unfertilized eggs or sperm. Tadpoles show typical thyroid effects after feeding with 3,5-*d*-diiodotyrosine, 3,5-*dl*-diiodotyrosine, iodized silk peptone, thyroglobulin, iodoalbumin D, or iodoserumalbumin A and D. Tyrosine + KI, dibromotyrosine, phenylalanine, *p*-iodophenylalanine and silk peptone were without effect. Tadpoles which have a thyroid effect have a diminished glycogen content of the liver.

G. H. S.

**Gas metabolism and metamorphosis in amphibia larvae after feeding upon thyroid or iodine-containing substances.** J. ABELIN AND N. SCHEINFINKEL. *Arch. ges. Physiol.* (Pflüger's) 198, 151-63(1923).—With the appearance of metamorphosis after thyroid feeding  $\text{CO}_2$  elimination diminishes and with the continuation of development the elimination becomes less and less, so that toward the end of the metamorphosis it amts. to but 50 to 70% of the normal value for the larval period. Metamorphosis is also stimulated by diiodotyrosine and diiodotyramine and the changes in gas metabolism resemble those of thyroid feeding. Similar effects are noted in the axolotl. Immediately after starting thyroid feeding there is an increase of short duration in the gas metabolism and this may be the stimulus for the metamorphosis. The subsequent depression in metabolic activity may be a protective measure.

G. H. S.

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

**Recent developments in food chemistry.** RICHARD DIETZEL AND KURT TÄUFEL. *Z. angew. Chem.* 36, 201-5(1923).

E. H.

**Advances in the chemistry of synthetic sweeteners and related compounds in 1922.** WALTER HERZOG. *Z. angew. Chem.* 36, 223-7(1923).

E. H.

**Alcohol content of bread.** THURE SUNDBERG. *Svensk Kem. Tids.* 35, 109-15 (1923).—Nineteen samples of bread were obtained in the open market and examined for alc. The alc. was sepd. from the bread by steam distn. The samples were cut into small pieces and placed in a 2-l. flask which was in turn placed in a bath consisting of  $\text{CaCl}_2$  soln. kept at  $105^\circ$ . When 100 cc. distillate had collected the receiver was replaced, the temp. raised to  $110-5^\circ$ , and a second 100 cc. obtained. These distillates were titrated for acid, neutralized, and redistd. The values are dependent upon the types of bread and time of storage. The acidity expressed in terms of cc. 0.1 *N* alkali ranges from 1.8 to 21.6 and the alc. content from 0.00 to 0.84%. The lowest figures for the alc. are for sliced bread exposed for 6 or more days. The highest values represent fresh bread in which sirup was mixed with the dough. In no case did the first 100 cc. distillate contain all of the alc. (when more than 0.02% alc. was present).

A. R. ROSE

**Bleaching and maturing of flour.** F. L. DUNLAP. *J. Am. Assoc. Cereal Chem.* 8, 9-19(1923); cf. *C. A.* 16, 3136; 17, 835.

RUTH BUCHANAN

**Examination of (determination of fat in) condensed milk.** K. BRAUER. *Z. offenl. Chem.* 28, 197-9(1922).—Two g. of the sample is diluted with about 400 cc. of water and treated with 10 cc. of Fehling soln. (34.63 g. of  $\text{CuSO}_4$  in 300 cc.) and 6.5-7.5 cc. of a soln. contg. 10.2 g. of NaOH per l. The liquid should be neutral or slightly acid when the ppt. has settled. It is filtered and the ppt. washed once by decantation, transferred to the filter, and well washed. The ppt. and filter are dried and extd. with ether, and the fat is weighed as usual. This is the only method found to give accurate results in condensed milks rich in sugar.

J. S. C. I.

**A note on the variation in the composition of milk of individual buffaloes.** D. L. SAHASRABUDDHE. *J. Proc. Asiatic Soc. Bengal, Proc. 8th Indian Sci. Cong.* 17, lxxviii (1921).

E. J. C.

**The composition of the milk of some United Provinces cows and buffaloes throughout their period of lactation.** P. S. MACMAHON, B. M. GUPTA AND P. C. MUKERJI. *J. Proc. Asiatic Soc. Bengal, Proc. 8th Indian Sci. Cong.* 17, XC(1921).—The results of over 1,000 analyses are tabulated. The object was to establish a reliable milk standard for the U. P. In individual animals large fluctuations in compn. occur without any appearance of regularity.

E. J. C.



**An unusual natural butter.** T. KOMNENOS. *Chem. Umschau* 30, 17-8(1923).—K. examd. an almost liquid butter by filtering and analyzing the solid (51%) and liquid portion (49%) separately. The consts. for the liquid, the solid, and for pure butter, resp., are: sp. gr. 0.870, 0.8675, 0.865-0.870;  $n_{40}$  43.4, 43.4, 39.4-46; R.-M. no. 32.15, 30.19, 24-34; Polenske no. 7.36, 7.34, 1.5-3.0; acid no. 6.17, 3.06, —; Grismer no. 55.73, 60.39, 53-57; solidifying point—below 0°, 21.4°, 19.5-25.5°; I no. 62.03, 34.92, 26-38; phytosterol, absent. K. concludes that the butter is pure and that its semi-liquid consistency is probably due to an excess of oily constituents in the food of the cows. P. ESCHER

**Quantitative determination of amino acids of seeds.** II. The amino acids of linseed meal, wheat bran, soy beans and red clover hay. T. S. HAMILTON, N. UYU, J. B. BAKER AND H. S. GRINDLEY. *J. Am. Chem. Soc.* 45, 815-9(1923); cf. C. A. 16, 299.—Below are the amts. of N in the various fractions, expressed in % of the total N, of soy beans (total N, 6.791%), wheat bran (2.413), linseed meal (5.070) and red clover hay (1.984), resp.; the results are the av. of detns. on 4-6 samples of each feed: total basic, 28.94, 24.02, 26.81, 15.40; ammonia, 9.38, 9.17, 10.86, 7.35; humin, 2.87, 6.86, 5.09, 13.09; arginine, 15.70, 11.99, 15.92, 6.86; cystine, 1.46, 0.81, 1.07, 0.87; histidine, 5.60, 7.32, 6.14, 5.05; lysine, 6.18, 3.90, 3.68, 2.62; monoamino acid N, amino N in filtrate from bases, 48.28, 38.07, 44.55, 39.82; proline, oxyproline, tryptophan, etc., non-amino N in filtrate from bases, 2.43, 3.59, 3.26, 3.28; Et<sub>2</sub>O-sol., 0.16, 0.04, 0.12, 0.82; alc.-sol., 0.58, 1.23, 0.37, 1.57; non-protein N sol. in cold 1% CCl<sub>4</sub>CO<sub>2</sub>H filtrate from colloidal Fe, 5.55, 15.26, 7.88, 11.29; left in the residues, 0.135, 0.743, (0.478 in another place), 0.409, 4.929. Earlier detns. on bloodmeal, skim milk, tankage, alfalfa, cottonseed meal, oats, wheat, corn and barley are given for comparison. C. A. R.

**The determination of hydrocyanic acid in Burma beans (*Phaseolus lunatus*).** J. CHARLTON. *Agr. Research Inst. Pusa, Bull.* 140, 7 pp.(1922).—The amt. of HCN liberated by enzyme reaction increases with the age of the bean. The addn. of malt while steeping increases the HCN liberation of new beans, but decreases that of old beans (over 1 yr.). HENRY W. EASTERWOOD

**Quick method for determining protein in wheat.** P. H. BIMMERMAN AND W. L. FRANK. *J. Am. Assoc. Cereal Chem.* 8, 49-53(1923).—The official Gunning method is modified by the addn. of a few cc. of HClO<sub>4</sub>. Cf. C. A. 16, 3135. R. B.

**Chemical composition and nutritive value of the straw of different varieties of wheat grown under the same cultural conditions.** I. ALBERTONI AND G. BOSINELLI. *Stas. sper. agrar. ital.* 54, 129-36(1921); *Botan. Abstracts* 11, 297. H. G.

**Hydrolysis of straw according to the Beckmann method.** II. Influence of amount of lye upon the extent of freeing the nutrient substances. GUSTAV FINGERLING, KÄTHE SCHMIDT AND AUGUST SCHUSTER. *Landw. Vers. Sta.* 100, 1-19(1922).—In expts. to det. the digestibility of straw NaOH was used in amts. of 12, 10, 8, 6, 4, and 2 kg. per 100 kg. of straw. The compn. of the materials and the effect upon feeding sheep are tabulated. F. M. SCHERTZ

**Dehydrating animal and vegetable materials.** G. H. BENJAMIN. U. S. 1,448,512, Mar. 13. Before dehydration, vegetable materials are given a preliminary treatment which in the case of cosscts from tubers consists in immersion in a dil. soln. of NaCl and HOAc, heated to about 65° to destroy bacteria and prevent discoloration. Lettuce, spinach or other leaves are treated, instead, with a very dil. NaHCO<sub>3</sub> soln. for 2 min. and beets may be treated with hot H<sub>2</sub>O for 12 min. The soda soln. sets the color of the vegetables. A similar effect is also attained by exposure of the material to elec. light during dehydration. The materials are dried partially by radiant heat at a temp. of about 65° or lower and are then treated with air currents of a slightly higher temp. to effect additional dehydration. Animal substances are prepd. for dehydration by treatment for a short time with a hot dil. NaCl soln. followed by centrifuging and immersion in soy bean oil or other oil which forms a protecting film around the material.

**Imitation powdered milk.** YOSHITARO YAMAMOTO, ISOMI MIZUSAWA AND THE TOKYO TAKUSHOKU KABUSHIKI KAISHA. Japan. 40,711, Nov. 24, 1921. Addn. to 34,949. The milk is a mixt. of 60% powd. special soy bean, 10% corn starch and 15% each of milk and cane sugars. The powd. soy beans are prepd. as follows: Crushed soy beans or bean refuse is immersed in 1-5% vinegar or a soln. of 7-20 g. of AcOH in 18 l. of H<sub>2</sub>O until the special odor of the bean is removed, this neutralized with NaHCO<sub>3</sub> soln., washed with H<sub>2</sub>O, dried, and powd.

**Transferring tea flavor.** TOMOSAKU HAYASHI, SHUMJI SHIMIZU AND THE NIPPON

CHASEI KABUSHIKI KAISHA. Japan. 40,696, Nov. 18, 1921. Tea having superior flavor is heated below 60° in a closed vessel, into which purified CO<sub>2</sub> is introduced, and the mixt. of CO<sub>2</sub> and the evolved flavor is transferred to a suitable vessel, in which the tea ext. or tea having no flavor is previously put, by which flavor of one tea is transferred to the other.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Chemical independence.** F. P. GARVAN. Separate publ. by Synthetic Org. Chem. Mfrs. Assoc. of U. S., 1923, 8 pp.—An address. E. J. C.

**Unusual occupational injury.** J. C. PRYOR. *U. S. Naval Med. Bull.* 18, 77-9 (1923).—A boiler maker after working inside the uptake of the smoke pipe on U.S.S. Henderson was found to be severely burned, the clothing of his back, which had been in contact with the soot, literally dropping off. The fire under this uptake had been extinguished 2 days previously. The patient after a shower and alk. bath had an uneventful recovery. Analysis of a sample of the soot gave SiO<sub>2</sub> 1.79, Fe<sub>2</sub>O<sub>3</sub> 6.64, H<sub>2</sub>SO<sub>4</sub> 35.71 and C 55.86. The corrosion was caused by H<sub>2</sub>SO<sub>4</sub> which was synthesized from the S in the oil used in the burners. In the other stacks a longer period elapsed between extinguishing the burners and entering the uptake, thus giving time for rain and high humidity to dil. the acid. This incident shows the necessity of adhering strictly to the Navy specifications concerning the S content of fuel oil. L. W. RIGGS

**Vapor recompression systems for evaporators.** I, II. W. L. BADGER. *Chem. Met. Eng.* 28, 26-31, 73-8 (1923).—Following an historical and descriptive section there are numerous calcs. comparing thermo-compressors with ordinary evaporators. If exhaust steam is available for evapg., a thermo-compressor could not be considered. If additional boiler steam must be raised there is a possibility of using a thermo-compressor driven by a steam turbine, the exhaust from which goes to the evaporator along with the compressed vapors. This will, in general, be more economical than driving a thermo-compressor with a condensing turbine; or reducing high-pressure steam for make-up to an ordinary evaporator. A bibliography of 50 articles and 47 patents is added. W. L. BADGER

**Regulation of the temperature of superheated steam.** JOSEF LAJBL. *Z. Zucker-ind. czechoslovak. Rep.* 47, 258-62 (1923); *Lisly Cukrovár.* 40, 583 (1922).—If the demand for superheated steam is irregular, during periods of low demand the amt. of superheat will be excessive. This is undesirable because of decompn. of cylinder oil and possibility of overheating the metal of the superheater. Consequently some method of absorbing part of the superheat may sometimes be necessary. One system places a desuperheater between the superheater and the engine. This is usually fed with boiler feed. Operating data are given showing a reducing of superheat from 170° to 130°. In the second case a tubular heater is connected between the boiler and the superheater. This condenses part of the satd. steam coming from the boiler and consequently sends it to the superheater carrying a mist of liquid H<sub>2</sub>O. This is preferable to the previous method in that it keeps the temp. of the superheater considerably lower. A superheater of 8 sq. m. (86 sq. ft.) cooled 4680 kg. of steam per hr., condensing 11.2%. With a mean temp. difference of 68.9° the heat transfer coeff. was 15.7 Cal. per sq. m. per ° per hr. (3.2 in English units.) W. L. BADGER

**Further researches on the strength of materials.** W. E. DALBY. *Proc. Roy. Soc. (London)* 103A, 8-25 (1923).—An app. previously described (cf. *Proc. Roy. Soc. (London)* 86A, 1912) for taking photographic records of the load and corresponding extension of metal test pieces has been modified so that records can be taken of alternating loading between tensile and compressive limits. A new recording instrument is also described for obtaining records of torque and twist between positive and negative limits. Typical curves are shown and their theoretical significance is discussed. S. L. CHISHOLM

**Testing the quality of lubricating oils.** W. H. HERSCHEL. *Proc. Eng. Soc. Western Penn.* 38, 503-58 (1923).—The necessary properties of a lubricant are of two classes: those which assure suitability of the lubricant when new, and those which indicate durability. Some of the usual tests show neither. The various tests in use for the detn. of the properties of lubricating oils are discussed under the headings: gravity, color, fire and flash points, pour point, viscosity, oiliness, emulsion tests and org. acidity, C residue test and the Waters carbonization test. Gravity is necessary to det. abs. viscosity; fire and flash points are inadequate substitutes for an evapg. test or fractional

distn.; and the pour point and viscosity det. suitability but not quality. The less common tests which give promise of detg. quality are demulsibility, org. acidity, C residue and carbonization. The Waters test is preferred to the C residue test because it is believed that oils are, in general, exposed to a moderate heat which tends to produce oxidation, rather than to a heat intense and prolonged enough to produce cracking. This test appears the best for measuring the resistance of an oil to oxidation, the greatest cause of deterioration of lubricating oils. A comprehensive bibliography is appended. An open discussion follows this paper. C. B. EDWARDS

**The "Universal" and the fireman's masks.** S. H. KATZ, J. J. BLOOMFIELD AND A. C. FIELDNER. *Bur. Mines, Tech. Paper* 300, 22 pp. (1923).—The "Universal" gas mask contains: activated nut charcoal, filter of cotton wool, NaOH impregnated on pumice, cotton wool, fused  $\text{CaCl}_2$ , Hopcalite (CO catalyst consisting of oxides of Mn, Cu, and sometimes Ag and Co), silica gel and filter of cotton wool. The fireman's mask is designed particularly to protect against CO. Its small size limits the life of the cannister and 4 hours allows a large factor of safety. Both types of masks and tests conducted upon them are fully described and illus. The appendix outlines standard tests required for all gas masks used by the Bureau of Mines in its investigations.

W. H. BOYNTON

**The use of breathing appliances in chemical works.** LEONARD LEVY. *Chem. Age* (London) 8, 362-3 (1923).—The best respirators consist of 3 portions: a face-piece, a connecting tube, and a purifying chamber carried by a suitable harness. For chem. works the breathing appliance should have a respirator affording complete protection against any concns. of toxic substances, should be reasonably comfortable to wear, with ample warning of approaching breakdown, should not deteriorate when not in use, and be so designed that it can be put on quickly with perfect fit assured. Refills for the purifying chamber should be inexpensive. Two types of respirators are available: one functioning by a perfect purification of the contaminated atm. and only available where the proportion of O in the purified atm. is adequate; and one possessing a self-contained O breathing set. Each part, types of filling, and the breathing sets are described.

W. H. BOYNTON

Tables of thermodynamic properties of  $\text{NH}_3$  (ANON) 2. Industrial mold enzymes (OSHIMA, CHURCH) 11A. Composition of mineral cylinder oils (MARCUSON) 22.

**Continuous fusions.** W. O. MITSCHERLING. U. S. 1,452,520, Apr. 24. In carrying out continuous fusions, e. g., in fusions with NaOH, the materials are passed through a rapidly rotating heated tube.

**Recovering volatile vapors from aeroform mixtures.** E. A. BARRET. U. S. 1,452,778, Apr. 24. Aeroform mixts. contg. petroleum, gasoline, alc., ether or alc. vapors are passed into a column contg. a suitable absorbent liquid, additional absorbent liquid is fed to the column as the aeroform mixt. passes through it, and the feed of absorbent and distn. of the volatile vapor are automatically regulated.

**Insulating material from bark.** P. E. H. ROUSSAN. U. S. 1,453,185, Apr. 24. An insulating material adapted for use instead of cork on steam pipes, in refrigerator walls, etc., is formed from the bark of *Maleleuca leucadendron*.

**Fireproofing material for timber, cotton, and paper, etc.** TAIZAN SEIGA. Japan. 41,008, Dec. 7, 1921. Addn. to 40,506 (C. A. 17, 1870). The material is a mixt. of borax,  $\text{MgSO}_4$  and  $(\text{NH}_4)_2\text{SO}_4$ ; AcOH is used as a solvent of Mg borate. 100 parts of borax is dissolved in 300 parts of  $\text{H}_2\text{O}$  at 70-80°, to which a hot soln. of 100 parts of  $\text{MgSO}_4$  in 100 parts of  $\text{H}_2\text{O}$  is added, and the ppt. produced is dissolved by adding 80 parts of AcOH dild. with 4 parts of  $\text{H}_2\text{O}$ . By addn. of 100 parts  $(\text{NH}_4)_2\text{SO}_4$  in 500 parts of  $\text{H}_2\text{O}$ , the material is completed.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW AND C. C. BAKER

**Determination and correction of the hardness of water.** ED. JUSTIN-MUELLER. *Industrie chimique* 10, 111-2 (1923).—A soap test for detg. hardness, not differing essentially from standard methods, is described. The importance of knowing temporary and permanent hardness in order to apply appropriate treatment is stressed. Temporary hardness is eliminated by addn. of the proper amt. of NaOH, which forms  $\text{Na}_2\text{CO}_3$ , and the latter reduces the permanent hardness by an amt. equiv. to the temporary

hardness, so that  $\text{Na}_2\text{CO}_3$  equiv. only to the difference between permanent and temporary hardness need be added.

**Determination of combined carbonic acid ( $\text{CO}_3$  ion) in sulfur waters.** F. TOUPLAIN and J. DUBIEF. *Ann. fals.* 16, 76-80(1923).—To 200 cc. of water in a 300 cc. Erlenmeyer flask add a slight excess of  $\text{PbO}_2$ , shake 10-15 min., add 10 cc. of 3%  $\text{H}_2\text{O}_2$ , heat gradually to  $45^\circ$ , maintain 30 min., let cool, filter, evap. 100 cc. of the filtrate to dryness, take up with  $\text{H}_2\text{O}$ , liberate  $\text{CO}_2$  with  $\text{H}_2\text{SO}_4\text{-K}_2\text{Cr}_2\text{O}_7$  mixt., and absorb in  $\text{NaOH-Ca(OH)}_2$ .

**Rapid determination of total iodine in sulfur waters.** J. DUBIEF. *Ann. fals.* 16, 80-2(1923).—To 50 or 100 cc. of the sample in a 100 cc. glass-stoppered graduated cylinder add 4 cc. of 10%  $\text{NaHCO}_3$ , add  $\text{KMnO}_4$  (25 g. per l.) to pink coloration, and then 5 cc. in excess, cool below  $10^\circ$ , add 2 cc. of  $\text{CS}_2$ , add 5 cc. concd.  $\text{H}_2\text{SO}_4$ , drop by drop, avoiding any rise in temp., decolorize with 3%  $\text{H}_2\text{O}_2$  (about 2 cc.). If the sample contains more than 5 times as much Br as I add a drop of 0.1 N KCNS, shake, and repeat alternate additions of KCNS (avoiding excess) and shakings till the yellow color of the Br is discharged, shake till the violet color of I in  $\text{CS}_2$  has developed, and compare with standards prep'd. by the same method. If there is less than 5 times as much Br as I, the addn. of KCNS can be omitted. Cl does not interfere. By addn. of KCNS 0.00005 g. of KI mixed with 0.1 g. of KBr was det'd. The method is sensitive to 0.02 mg. per portion tested. The latter should not contain over 0.5 mg. If the temp. is kept below  $10^\circ$ , the method is as accurate as the  $\text{NaNO}_2$  method.

**Indicators for  $p_H$  control of alum dosages.** BARNETT COHEN. *U. S. Pub. Health Repts.* 38, 739-40(1923).—Indicators suggested are:

	4.5.	5.0.	Color at $p_H$ 5.5.	6.0.	6.5.
Methyl red.....	red	red	orange	yellow	yellow
Bromo-cresol green.....	yellow	green	blue	blue	blue
Bromo-phenol red.....	yellow	yellow	yellow	orange	red
Bromo-thymol blue.....	yellow	yellow	yellow	yellow	green

After detg. the  $p_H$  best suited to particular conditions the proper indicator may be chosen.

**Industrial water.** G. PARIS. *Chimie et industrie* 9, 439-53(1923).—A general description of the various methods of purifying water, especially for boilers. A. P.-C.

**Softening of industrial waters by means of permutite.** D. MAROTTA. *Giorn. chim. ind. applicata* 5, 10-2(1923).—A discussion of the action of permutite upon hard waters, with an analysis of a sample of the product, and a description of the fillers, their functioning and the cost of maintenance. A photograph and 2 sketches are given.

**Purification of water with lime.** II. J. SMIT. *Meded. Burgerl. Geneesk. Dienst. Nederland. Indië* 1921, No. 2, 111-89; *Expt. Sta. Record* 47, 288; cf. *C. A.* 15, 1050.—The action of the quicklime due to its high alk. is much more marked than that of Al. The alk. water is neutralized by a small amt. of  $\text{CO}_2$  or by thorough aeration.

**Summary of installations of public water supplies in Austria.** A. SWETZ. *Mitt. Volksgesundheitsamts* (Nov. 1, 1922); *Bull. mens. office intern. hyg. publ.* 15, 141(1923); cf. *C. A.* 16, 134.—There are very few purification plants as the watersheds are protected.

**The potable water supplies of the cities of the Ruhr.** "L. D." *L'eau* 16, 17(1923).—A historical development of the supplies of the region together with a map showing location of plants, reservoirs, etc., is given.

**Purification of drinking water for troops in the field.** ANTONIO ANGELINI. *Giorn. med. militare* 71, 22(1923); *Bull. mens. office intern. hyg. publ.* 15, 409(1923).—Germicides used in water purification were found to affect water saprophytes in decreasing order as follows:  $\text{NaOCl}$ , "Idrosan," tincture of  $\text{I}_2$ ,  $\text{KMnO}_4$  and powders based on permanganates.

**Resumé of literature concerning removal and treatment of domestic wastes during and since the War.** THIESING. *Zentr. ges. Hyg.* Oct. 15 and 25, 1922; *Bull. mens. office intern. hyg. publ.* 15, 145(1923).—The review contains a bibliography of about 200 references.

**A rural problem in sanitation.** C. C. WHIPPLE. *Pub. Health* (Mich. State Bd. Health) 11, 125(1923).—The problem of rural excreta disposal and its influence on the water supply and plumbing is discussed.

**Application of swimming pool sanitation to the public bathing beach.** W. P. BAKER.

*J. Am. Med. Assoc.* 80, 907-9(1923).—The motor boat and its equipment for treating the waters of the tidal basin at Washington D. C. with Cl is described. The attempt was made, with fair success, to maintain the residual Cl content between 0.02 and 0.5 p.p.m. in the water of the bathing beach. From a total bacterial count of more than 175,000 per cc. in the Potomac water entering the basin, chlorination caused a reduction to less than 100, and *B. coli* was only occasionally found in 10 cc. portions. The anaerobic lactose fermenters (*Clostridium welchii* group) are not affected by Cl of this concn. Several hundred thousand persons bathe at this beach and no infection traceable to such bathing has occurred during the past two seasons. It is thought that the Cl treatment takes care of any pollution of the water by infected bathers, along with destruction of bacteria from constant sewage contamination. L. W. RIGGS

**Swimming pool conjunctivitis.** F. BRST. *Münch. med. Wochschr.* 69, 621(1922); *Bull. mens. office internat. hyg. publ.* 15, 129(1923).—Symptoms are described. Chlorination of the pool water is advised. JACK J. HINMAN, JR.

**Marine soaps and parasitocides.** F. BRUNET. *Arch. med. pharm. navales* 112, 414(1922); *Bull. mens. internat. office hyg. publ.* 15, 135(1923).—Salt water soap contains much glycerol and alkali and hence removes epithelial debris and grease. It is recommended for clothes and other articles not damaged by sea water. *Parasitocidal soap* contains 20 g. HgCNO to 1 kg. of castile soap. Lather kills head lice in 5 min., eggs and larvae in 10 min. Use 3 successive days causes little irritation of the skin. *Kerosene soap:* Formula: 650 g. castile soap, 100 g. yellow wax, 250 g. kerosene. It is recommended for killing lice and larvae in the hair of women and children. JACK J. HINMAN, JR.

Residual waters of cokeries (DURAND) 21.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Relation between hydrogen-ion concentration and physical properties of soil.** O. ARRHENIUS. *Geol. För. Förh.* 44, 745-9(1922).—Fifty-g. portions of clay sieved to 0.5 mm. mesh were suspended in 200 cc. H<sub>2</sub>O, different amts. of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>CO<sub>3</sub> or of CaO<sub>2</sub>H<sub>2</sub> and NaOH added, and vols. made up to 250 cc. \* The mixes. were shaken, allowed to settle for 1½ months and filtered. The residue was tested for fineness and hygroscopicity. The H<sub>2</sub>O capacity was detd. by moistening a weighed amt. of the soil with water from a buret, baking and calcg. the H<sub>2</sub>O per g. of dry substance. Tables and curves are given. High settling rate, max. clay column and fineness occur at high alkyl. and acidity, and at the isoelec. point. The hygroscopicity is low at these points but high when the clay is more stabilized. The H<sub>2</sub>O capacity is 31 ± 0.5 even if the reaction has been much changed. The effects of these results on soil analysis and plant physiology are pointed out. W. SEGERBLOM

**The formation of soil crumb structure and tilth.** P. EHRENBORG. *Landsk. Vers. Sta.* 99, 115-21(1922); *Exp. Sta. Rec.* 47, 722.—A discussion of the effect on soil structure of OH, Ca and alkali metal ions. F. M. SCHERTZ

**Variability of alkali soil.** W. P. KELLEY. *Soil Science* 14, 177-89(1922).—Samples taken only 2 ft. apart showed differences of more than 600 % in Cl and more than 1000 % in SO<sub>4</sub> content. For this reason analyses of single soil samples may be worthless. Composite samples cannot be relied upon unless composed of a very large no. of individual samples. The character of the vegetation is one of the safest guides in sampling alkali soils. Accurate detn. of alkali tolerance of plants cannot be made by field cultures alone because (1) alkali soils usually contain more than one kind of salt, (2) concns. of various salts vary independently, (3) the soil on one side of a plant may be highly saline while the other is comparatively free from salts. R. BRADFIELD

**A note on the changes produced in heated soils.** D. L. SAHASRABUDHIE. *J. Proc. Asiatic Soc. Bengal, Proc. 8th Indian Sci. Cong.* 17, lxxxviii(1921).—The general effect of heating on the phys. condition of the soil is to make it less sticky. By heating the soil its inorg. as well as org. substances become more sol. The catalytic power of the soil decreases by heating. The rate of O absorption in the soil is increased by heating. If any protozoa are present in the soil they are destroyed. Growth of the bacterial life is encouraged and a beneficial effect is produced on the growth of rice seedlings. E. J. C.

**The soil solution, extracted by Lipman's direct-pressure method compared with 1:5 water extracts.** P. S. BURGESS. *Soils Science* 14, 191-215(1922).—A series of

fine sandy loam soils was brought to their optimum  $H_2O$  content and the "soil solution" was extd. by pressures as high as 500,000 lbs. per sq. in. Successive fractions of the soln. extd. by increasing pressures had approx. the same compn., indicating that pressures as high as 16,000 lbs. per sq. in. did not affect the soly. of the soil minerals. No abrasion of even the larger soil particles was noticed. From 45 to 65% of the total moisture was extd. from the series of soils by the uniform final pressure of 16,000 lbs. per sq. in. But little soln. was extd. by pressures over 10,000 lbs. The  $H_2O$  content after pressing was within less than 1% of the calcd. wilting coeff. The av. amts. of Ca, Mg and  $NO_3$  extd. by the pressure method and by the regular 1:5 water extn. were practically alike, 3.5 times as much K, 1.7 times as much  $SO_4$ , and 30 times as much P were removed by the 1:5 extn. method.

R. BRADFIELD

**The relation of concentration of soil solution to nitric nitrogen in soils containing large quantities of available nitrogen and their effect upon plant growth.** New Mexico Agr. Expt. Sta., *Ann. Rept.* 1921, 24-25.—It was detd. by a field survey that when nitrates were in excessive quantities in the soil, other sol. salts also occurred in excessive quantities. As the total salts increased,  $NO_3$  increased more rapidly. It was found that most injury was due to sulfate and chlorides rather than nitrates. J. J. S.

**Laboratory study of the toxicity of some sulfur fungicides.** W. L. DORAN. N. Hampshire Agr. Expt. Sta., *Tech. Bull.* 19, 11 pp. (1922).—Com. lime-sulfur solns. when dild. 10 to 40 times do not prevent germination of the conidia of *Venturia inaequalis* when sulfides are absent. S is fungicidal when O is present, but not when O is absent. Its toxicity to fungi increases with increase of temp. and time of exposure. The toxicity of S to a number of fungi is discussed.

J. J. SKINNER

**Organic matter studies.** F. J. SIEVERS. Washington Agr. Expt. Sta., *Bull.* 167, 45-6 (1922).—The incorporation of straw having a N-C ratio of 1 to 75 in the soil produced a depressing effect on  $NO_3$  development, which persists until there is sufficient decompn. to cause the ratio to approach that in the soil 1 to 13. When org. matter having a narrow N-C ratio like legumes is incorporated in the soil there is a rapid  $NO_3$  development. There is less loss of  $CO_2$  and indication of greater org. matter maintenance.

J. J. SKINNER

**Humus investigations.** Iowa Agr. Exp. Sta., *Ann. Rept.* 1921, p. 59.—In 50 soil types it was found that no correlation exists between lime requirement and H-ion concn. The phys. character of the soil and its org. matter content influence its lime requirement. Molds inoculated into acid solns. cause a change towards alkali, while if inoculated into alk. media cause a change towards acidity. The range of H-ion concn. for the growth of molds is wide.

J. J. SKINNER

**The effect of fertilizers on germination and seedling growth.** M. E. SHERWIN. *J. Am. Soc. Agron.* 15, 66-73 (1923).—The presence of fertilizers generally inhibits germination. Inhibition is greater when the fertilizer is in direct contact with the seed than when it is mixed with the soil. The retarding of germination is greater by sol. mineral fertilizers than by the less sol. mineral or the org. materials. Apparently, the inhibiting action is not due to a direct effect of the fertilizers upon the viability of the seed, but to a retarding influence by sol. mineral fertilizers upon the osmotic absorption of water from the soil by the seed and to stimulation by org. fertilizers of the growth of fungi, especially molds, which are injurious to the root systems of the young seedlings. Borax in amts. as small as 3.5 lbs. per acre exerted a marked inhibiting effect upon root growth.

F. M. SCHERTZ

**Peat as a fertilizer ingredient.** FRED WIEDMER. *J. Am. Peat Soc.* 16, 52-4 (1923).

J. J. W.

**Significance of displaceable potash in soils in plant nutrition.** A. VON NOSTITZ. *J. Landw.* 70, 45-72 (1922).—Soils packed in tubes were leached with 5%  $NH_4NO_3$  soln. and the exts. examd. for other bases. Ca, Mg, K and Na appeared in considerable quantities, and the rate of extn. of successive amts. of  $NH_4NO_3$  soln. was in the order named. In no case could the total amt. of a base present in the soil be removed by this process. A similar basic exchange was shown to occur with mica and feldspar. Comparison was made in pot expts. between plants grown in the original soil and in that leached with  $NH_4NO_3$  soln., to which were added, resp., the amts. of Ca and Mg, or of Ca, Mg, and K removed by the leaching. Suitable adjustments were made for the increased N content of the leached soil. Plants grown in the leached soil with addn. of Ca, Mg and K were only slightly inferior to those in the original soil, but those grown in leached soil with addn. of only Ca and Mg showed every sign of potash starvation. A second crop on the same soils gave similar results. The germination of the seeds in the soil lacking potash was slow and the growth of the plants poor from the first. Sand cultures showed that germination of seeds increased with the proportion of potash in

the culture soln., as also did the rate of growth of the seedlings, but the optimum potash content depended upon the amts. of Ca and Mg present. In estg. the fertilizer requirements of soils the amt. of K which can be liberated by a process of base interchange should be taken into consideration. J. C. S. I.

**Experiments with nitrogen fertilizers.** E. HASELHOFF, O. LIEHR AND K. FLUEHRER. *Landw. Vers. Sta.* 100, 37-58(1922).—A rept. of expts. with  $\text{CaCN}_2$  and other air-N fertilizers, also with  $\text{NH}_4\text{HCO}_3$ . F. M. SCHERTZ

**Assimilability of the phosphatic fertilizers.** A. DEMOLON AND P. BOISCHOT. *Compt. rend.* 176, 777-9; *Compt. rend. agr. France* 9, 316-21(1923).—Samples of fertilizers, each in amts. corresponding to 110 mg.  $\text{P}_2\text{O}_5$ , were tested for soly. in 200 cc. of  $\text{H}_2\text{O}$  satd. with  $\text{CO}_2$  by alternate 15-min. periods of bubbling and shaking for 1 hr. The results in % of  $\text{P}_2\text{O}_5$  dissolved were Thomas slag 29.05, pptd. phosphate 90.0, mineral superphosphate 93.9, degelatinized bone 32.7, chalk phosphate of Fauconzy decarbonated 6.4, phosphate of Gafsa decarbonated 8.15, and synthetic tricalcium phosphate 59.2. In a second series of tests 110 mg. of the phosphatic fertilizer was mixed with 760 mg. of pptd.  $\text{CaCO}_3$  and its soly. in water charged with  $\text{CO}_2$  detd., when 22.64% of Thomas slag, 67.8 of pptd. phosphate and 93.9 of mineral superphosphate were dissolved but only traces of the remaining 4 samples. Portions were incorporated with 10 g. of neutral decalcified earth and the following results were obtained without and with  $\text{CaCO}_3$ , resp. Thomas slag 35.3, 18.8, pptd. phosphate 80.7, 60.7, mineral superphosphate 47.4, 61.5, degelatinized bone 27.5, traces. L. W. RIGGS

**The economic use of phosphate deposits.** WM. H. WAGGAMAN. *J. Am. Soc. Agron.* 15, 152-8(1923).—The pyrolytic process of producing  $\text{P}_2\text{O}_5$  is discussed. Proof of the com. feasibility of this process has not as yet been obtained. Low-grade and run-of-mine phosphates can be employed. Elimination of the use of  $\text{H}_2\text{SO}_4$  and production of a concd. product are advantages of the method. F. M. SCHERTZ

**The effects of phosphate on early growth and maturity.** C. F. NOLL. *J. Am. Soc. Agron.* 15, 87-99(1923).—The use of phosphates at the Pa. Expt. Sta. has been accompanied by a greater growth, larger yields, and later ripening of tomatoes. The effects of different phosphatic fertilizers vary with the availability. The sol. phosphates, applied in moderate rates, as a rule have a more pronounced influence in hastening maturity than the same quantity of  $\text{P}_2\text{O}_5$  in rock phosphate. Increasing the rates of application of P fertilizers above the needs of the crop as indicated by yields has not been accompanied by further increases in earliness. Though phosphates show a more marked influence in promoting earliness than the other fertilizer elements, yet moderate amts. of N and K, where these are needed for the production of crops, have a similar effect. Lime, applied to soils having a high lime requirement, may induce early ripening. F. M. SCHERTZ

**Estimation of presumably assimilable phosphoric anhydride in soils.** CRO RAVENNA. *Giorn. chim. ind. applicata* 5, 129(1923).—This is a modification of Dyer's method; it gives results of greater accuracy. Dry 75 g. soil at  $110^\circ$ , place in a suitable flask of 1 l. capacity and add citric acid powder in sufficient amt. to decompose the limestone (1.4 g. citric acid per g. limestone). Pour upon the mixt. 750 cc. 1% citric acid, and after liberation of  $\text{CO}_2$  has ceased, close the flask with a rubber stopper and place in a rotating machine for 6 hrs. Filter, evap. 500 cc. of the filtrate to dryness on the water bath, introduce the residue into a Kjeldahl flask with 50 cc. 1.4  $\text{HNO}_3$ . Add a spatula point of  $\text{MnCO}_3$  and warm over a moderate flame. Very often the amt. of Mn dissolved out by the citric acid soln. from the soil is itself sufficient. The reaction is complete when effervescence and development of red vapors cease. (If red vapors still continue when the liquid is reduced to small vol., add 25-50 cc. additional  $\text{HNO}_3$  and reheat.) Boil for a few min., transfer to a dish, evap. to dryness on a water bath, and det.  $\text{P}_2\text{O}_5$  by the usual molybdate method. ROBERT S. POSMONTIER

**The comparative agricultural value of insoluble mineral phosphates of aluminium, iron and calcium.** J. S. MARAIS. *Soil Science* 13, 355-409(1922).—Mineral phosphates of Al and Fe were found to be valuable sources of P for plants. In some cases they were superior to Ca phosphate, in others inferior. Chemically pure phosphates of Al and Fe were as available as pure  $\text{Ca}_3(\text{PO}_4)_2$ . The mineral phosphates were not as readily available as the pure phosphates of the same metals, owing to the fact that most of them are the hydrated basic phosphates. Igniting these hydrated minerals caused dehydration and a considerable increase in availability. Al phosphates gave best returns on calcareous soils; iron phosphates were unaffected by the soils reaction while the tricalcium phosphates were most effective in an acid soil. A thorough review of the literature is given. R. BRADFELD

**Determining the phosphorus needs of soils.** E. TRUOG. *J. Am. Soc. Agron.* 15,

110-7(1923).—A less expensive and more rapid method is needed for detg. the P requirement of soils in a region like Wisconsin because of the great natural variation in the soils. A tentative table is reproduced which gives the min. percentages of total P deemed adequate for general farming in Wisconsin under different soil conditions.

F. M. SCHERTZ

**Methods of distribution of phosphorus fertilizers.** S. B. HASKELL. *J. Am. Soc. Agron.* 15, 141-52(1923).—Superphosphate, carrying a low % of water-sol. substances, applied alone is comparatively safe in any reasonable application, almost without regard to the method of application. When superphosphate comes in contact with the seed it is much safer than mixed fertilizer carrying N and K in addn. The retarding effect of fertilizers on germination varies with the crop, the soil and moisture conditions.

F. M. SCHERTZ

**Composting rock phosphates with organic ammoniates.** Georgia Agr. Exp. Sta., *Ann. Rept.* 1921, 9.—There was considerable loss of N when cottonseed meal, rock phosphate and soil were composted for 5 months. The addn. of a small amt. of  $(\text{NH}_4)_2\text{SO}_4$  lowered the loss of dry matter and N. The total  $\text{P}_2\text{O}_5$  made available during the composting ranged from 7 to 20%.

J. J. SKINNER

**The availability of rock phosphate in acid soils.** M. NELSON and W. H. SACHS. Arkansas Agr. Expt. Sta., *Bull.* 181, 15-6(1922).—The results indicate that corn can utilize P added to an acid soil in the form of finely ground rock phosphate. There is an increase in the % of P in the corn plant and in the total amt. in the crop. Lime added to acid soil treated with rock phosphate appears to decrease the amt. of P available for the corn plant.

J. J. SKINNER

**The foraging power of plants for rock phosphate.** F. C. BAUER. *J. Am. Soc. Agron.* 15, 99-109(1923).—A general discussion. The foraging power of plants for phosphate rock can be satisfactorily explained on the basis of the laws of mass action and chem. equil.

F. M. SCHERTZ

**Progress of sulfur investigations with Oregon soils.** W. L. POWERS. *J. Am. Soc. Agron.* 15, 158-60(1923).—A review.

F. M. SCHERTZ

**A note on oxidation of sulfur in Oregon soils.** J. S. JOFFE and H. C. McLEAN. *Soil Science* 14, 217-21(1922).—Eight soils known to respond to  $\text{SO}_4$  fertilization were treated with 2000 lbs. of S. Oxidation was slowest in the heavy clay soils, owing to poor aeration. On such soils the S should be applied far in advance of the growing season. The heavier soils may tolerate such heavy applications while lighter sandy soils may be injured by much smaller amts. owing to their low buffering power. Most of the soils studied were not seriously affected in reaction by the oxidation of 250 lbs. of elemental S per acre.

R. BRADFELD

**Influence of sulfur oxidation upon growth of soy beans and its effect on bacterial flora of soil.** W. RUDOLFS. *Soil Science* 14, 247-63(1922).—A slightly alk. soil which produced chlorosis was treated with 0 to 1000 lbs. S and the effect upon soil reaction, bacterial numbers and growth of soy beans noted. The  $p_{\text{H}}$  values of the aq. exts., made at frequent intervals during the incubation period, decreased for the first 9-11 wks., then came back toward the neutral point. The degree of acidity produced was proportional to the amt. of S applied. The P in rock phosphate was not rendered sol. in appreciable quantities until  $p_{\text{H}}$  values of about 3 were reached. Such acidity prohibited the growth of soy beans. To render P available by means of S they must be composted rather than applied simultaneously in the field. Small applications of S increased the growth of soy beans and bacterial numbers; larger applications (1000 lbs. and over) retarded both.

R. BRADFELD

**Experiments with caustic materials.** E. HASELHOFF, K. FLUHRER, and F. HAUN. *Landw. Vers. Sta.* 100, 59-78(1922).— $\text{MnSO}_4$ ,  $\text{MnCO}_3$ , Mn slag,  $\text{Pb}(\text{NO}_3)_2$ , flowers of sulfur, and "Milo Dünger," were used in pot and field expts. There was an absorption of S and Mn but none of Pb as detd. by plant analysis.

F. M. SCHERTZ

**Calcined phosphatic limestone as a fertilizer.** E. VAN ALSTINE. *Soil Science* 14, 265-79(1922).—Phosphatic limestone was calcined until all  $\text{CO}_2$  was driven off. The  $\text{CaO}$  was reduced to a very fine powder but there was no evidence, either chem. or microscopic, that the condition of the phosphate granules had been appreciably altered. Extensive sand and soil culture expts. indicated that the calcined phosphatic limestone is no better than the pulverized product.

R. BRADFELD

**Liming as a means of soil amendment.** F. HARDY. *West Indian Bull.* 19, No. 2, 161-89(1922).—A review of the effect of liming on soil texture, soil reaction, in counteracting toxicity and liberating plant-food constituents. Methods of detg. lime requirement are also discussed.

WM. HAZEN

**The effect of limes containing magnesium and calcium upon the chemical compo-**



sition of the soil and upon plant behavior. WM. MATHER. *Soil Science* 13, 337-54 (1922).—Three applications of hydrated magnesian and calcic limes and of ground magnesian and calcic limestones in carefully controlled field expts. show little difference in crop yields due to the various forms for an 11-yr. period. Each had an equal neutralizing power when used in equiv. amts. Sol.  $\text{Al}_2\text{O}_3$  was reduced by all lime applications. Plants were not influenced by the Ca-Mg ratio used. Normal  $\text{KNO}_3$  and  $\text{NH}_4\text{Cl}$  were almost as effective as 10%  $\text{HCl}$  in extg. Ca from this soil. Changes in the absorption of Ca by soy beans were not paralleled by similar fluctuations in the N content as would be expected from the theory of Truog.

R. BRADFELD

Effect of certain calcium compounds and other substances on the yield and calcium content of some crops. O. M. SHEDD. *Soil Science* 14, 233-46 (1922).—A pot study on the effect of different Ca salts upon the yield of soy beans, sweet clover, alfalfa and oats grown in rotation indicates that some Ky. soils do not have sufficient plant food Ca for optimum crop growth. Applications of Mg silicate reduced the Ca content of the hay and straw of all crops grown but appreciably increased the yield in many cases. The acidity of the soil was materially reduced in some cases but not sufficiently to account for all the increases in yield obtained.

R. BRADFELD

Comparative manurial value of the whole plants and the different parts of green manures. N. V. JOSHI. Agr. Research Inst. Pusa, *Bull.* 141, 14 pp. (1922).—Expts. show that the manurial value of plant leaves is much greater than that of the stems or roots. The stems and roots in most cases are detrimental.

H. W. EASTERWOOD

The injurious action of straw manuring and its prevention. OTTO RAHN. *Z. tech. Biol.* 7, 172-86 (1919); *Centr. Bakt. Parasitenk.*, II Abt. 53, 413 (1921); *Abstracts Bact.* 5, 442.—Easily assimilable C compds. are present in the soil only in minute quantities.  $\text{NH}_3$  and  $\text{HNO}_3$  can therefore accumulate. The addn. of straw and other plant substances rich in N stimulates an increase of microorganisms; a N minimum may then take place. This will appear more readily and last longer in N-poor than in N-rich soils. During this condition, the plants cannot obtain any N from the soil. With stable manure there is no fear of a N minimum, since the manure contains easily assimilable org. compds. which, together with the N compds. of the soil, are sufficient to satisfy the straw-decomposing organisms. A N minimum is possible only in the manuring with straw and in compost heaps. It can be overcome by means of N-fertilization. This N is then chiefly stored away and, with unfavorable atm. and soil conditions, even denitrified, so that it is not directly available to plants. The fertilization with N offers the only possibility of doing away with the N minimum. The nitrate is more ~~active~~ than  $\text{NH}_3$ . With ~~anaerobic straw decompos.~~ ~~the~~ ~~and~~ products are still good sources of C for many aerobic organisms, even for denitrifying bacteria. This is the necessary consequence of the energy balance in anaerobic phenomena. The toxins produced in the decompn. of N-poor substances injure the young plant seedlings.

H. G.

Microorganisms concerned in the oxidation of S in the soil (WAKSMAN) 11C.

Treating pebble phosphate rock. E. P. STEVENSON. U. S. 1,453,571, May 1. Pebble phosphate initially contg. tri-Ca phosphate,  $\text{CaCO}_3$ , moisture and org. materials is heated alone to a temp. of about 1000-1100° to decompose the  $\text{CaCO}_3$  and cause a substantially complete conversion of the resulting free lime into phosphate. The product is adapted for use as a fertilizer.

Preparation of stable and soluble phosphate from insoluble aluminium or iron phosphates. KÔMEI HAYASHI. Japan. 41,056, Dec. 13, 1921. Powd. insol. Al or Fe phosphate or their mixt. is heated at 300-400° with 10-15%  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ ,  $\text{HCl}$ , or their mixt. until the mixt. becomes yellow, by which time 98% of the phosphate can be dissolved with  $\text{NH}_4$  citrate.

## 16--THE FERMENTATION INDUSTRIES

C. N. FREY

Alcoholic fermentation. Mechanism of the decomposition of dextrose, according to Carl Neuberg. R. FABRE. *J. pharm. chim.* 27, 298-309 (1923).—A review.

S. WALDBOTT

Making alcohol from waste molasses. D. JESSURUN. *Sugar* 25, 173-5 (1923).—A description of the plant at Anaheim, Cal., for the production of alc. from beet molasses.

C. H. CHRISTMAN

**Alcohol from cellulose.** G. MEUNIER. *Bull. soc. encour. ind. nat.* 134, 766-77 (1922).—A monograph on the production of alc. for power purposes from wood and other cellulosic material. A process depending on the preliminary treatment of the material with acids (cf. *C. A.* 16, 1664) is outlined, with especial reference to subsidiary industries depending on the by-products—furfural, acetone, etc. The subject is discussed from the national and economic, rather than from the chem. standpoint.

J. S. C. I.

**Denaturizing alcohol.** F. BORDAS AND F. TOUPLAIN. *Compt. rend.* 176, 905-7 (1923).—A suitable denaturant will enable 800,000 hectoliters of alc. to be used as fuel in France. A denaturant which will be present in alc. distd. from denatured alc. was sought. Me and Et borates are mentioned.

H. E. WILLIAMS

**Detection of citric acid in wine and musts.** C. VON DER HEIDE AND H. STRAUBE. *Festschr. Jubiläum höheren staatl. Lehranst. Wein-, Obst-, u. Gartenbau* 336-69.—Methods depending on the sepn. of citric acid in the form of its salts are unreliable on account of possible contamination with malic acid. Stahre's reaction (*Nord. farm. Tidssk.* 1895, 141) or the modifications of it proposed by Kunz (*C. A.* 9, 687; 10, 647), and Krug and Rettinger (*Arbb. kais. Gesundh.* 49, 28), are recommended. The authors ppt. the Ba salts of the acids in wines and musts by means of alc., and exam. the ppt. for citric acid. Contrary to Kunz' assumption, it has been shown that natural wines and musts may contain citric acid. In nine Rhenish natural wines of the 1921 vintage, citric acid was found in quantities of 85-164 mg. per l. Whether citric acid is a normal constituent of German wines is uncertain.

J. S. C. I.

**The detection of fruit wine in grape wine.** F. SCHAEFFER. *Mitt. Lebensm. Hyg.* 14, 15-7 (1923).—Reply to criticism of Widmer (*Z. Vers. Wes. Deutschoesterr.* 23, 17 (1920)).

BURTON G. PHILBRICK

**Aldehyde determination in spirits.** WILHELM MÜLLER. *Mitt. Lebensm. Hyg.* 14, 1-14 (1923).—The colorimetric method of Enz, (*Schweiz. Lebensm.* 3, 341 (1917)) using standard solns. of metanil yellow and tropaeolin OO was checked against the titration method of Hoepner (*Z. Nahr. Genussm.* 34, 453 (1917)). In the latter 10 cc. of soln. with the aldehydes reduced by diln. to less than 5% in 30% soln. alc. are placed in an Erlenmeyer flask with 7.6 cc. of a 10% soln. of hydroxylamine-HCl soln. The flask is stoppered and set aside for 1/2 hour. The free acid is then titrated with 0.5 N NaOH (cc.  $\times$  0.22 g.). Using the same colors as Enz and pure *m*-phenylenediamine-HCl, the 2 methods check. The results are accurate to one decimal place if over 0.1% and two places if under. For contents over 1% and for fruit spirits the titration method is preferred.

BURTON G. PHILBRICK

**Comparison of the fermentation of  $\alpha$ - and  $\beta$ -glucose.** R. WILLSTÄTTER AND H. SOBOTKA. *Z. physiol. Chem.* 123, 164-9 (1922).—In the early period of fermentation of a soln. contg.  $\alpha$  and  $\beta$ -glucose in equil., the  $\alpha$ -form disappears faster than the  $\beta$ -form. At a later stage the rates approach each other and probably become identical. The difference in rates can only be detected when the fermentation occurs very rapidly, i. e., when time is not afforded for equil. continually to reestablish itself between the  $\alpha$ - and  $\beta$ -forms.

R. L. STEHLE

**Selective fermentation with galactose-adapted yeasts.** R. WILLSTÄTTER AND H. SOBOTKA. *Z. physiol. Chem.* 123, 176-80 (1922).—Yeasts which ferment galactose faster than glucose in pure solns. of these sugars ferment the latter faster in mixts. of the two.

R. L. STEHLE

**Selective fermentation of sugar mixtures.** R. WILLSTÄTTER AND H. SOBOTKA. *Z. physiol. Chem.* 123, 170-5 (1922); cf. preceding abstr.—In a soln. of invert sugars the dextrose ferments faster than the levulose.

R. L. STEHLE

Alcohol as fuel and its production in Italy (MEZZADROLI) 21.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Chinese materia medica:** Botanical, chemical and pharmacological reference list. B. E. READ. *Publ. of Peking Union Medical College* Feb., 1923.—900 Chinese drugs have been indexed with their botanical names. Complete references to all available literature are included bearing on their action and chem. identity. WM. H. ADOLPH

**The epinephrine content of commercial suprarenal "cortex" preparations.** E. J. BAUMANN. *Endocrinology* 7, 81-3 (1923).—Examin. of 7 com. suprarenal preps. made

by 3 different companies showed a variation in epinephrine [adrenaline] content ranging from 0.0041 to 0.0153 g. per g. dry defatted material. Since the normal content of epinephrine in such desiccated defatted cortex should have a min. value of 0.025 g., only a partial sepn. of cortex from medulla has been effected in these preps.

HARRY J. DEUEL, JR.

**The preparation of benzyl benzoate.** S. SCELBA. *Boll. chim. farm.* **62**, 33-4 (1923).—Finely powd. dry  $\text{BzONa}$  and a slight excess of  $\text{PhCH}_2\text{Cl}$  are heated in an oil bath at  $170-5^\circ$  for 24 hrs. The mixt. is cooled, treated with  $\text{H}_2\text{O}$ , then with  $\text{Na}_2\text{CO}_3$  to alk. reaction, sepd. from the aq. layer and distd. The yield is 70-75%.

A. W. DOX

**Identification of cantharidin. New method of extraction.** G. MARCHIOLO. *Boll. chim. farm.* **62**, 65-9 (1923).—Place 20 g. of finely powd. cantharides in a separatory funnel and add 200 g. of pure  $\text{HCO}_2\text{H}$  of 20 Bé. After standing 0.5 hr. add 200 cc. of distd.  $\text{H}_2\text{O}$ , shake occasionally during the day, drain off the liquid, wash the residue with considerable  $\text{H}_2\text{O}$ , filter the combined exts. and evap. on a water bath. The  $\text{HCO}_2\text{H}$  decomposes on evapn., leaving only the cantharidin and some coloring matter. Dissolve this residue in a minimum amt. of concd.  $\text{H}_2\text{SO}_4$ . This takes up the cantharidin and destroys the other org. matter. Add a large vol. of  $\text{H}_2\text{O}$  and collect the pptd. cantharidin on a tared filter. The method is applicable to both fresh and dried insects. It gives higher results than the usual method, *e. g.*, 0.8-0.9% as compared with 0.65%, on account of a more complete extn. The cantharidin extd. by  $\text{HCO}_2\text{H}$  may also be purified by successive treatment, with boiling  $\text{EtOH}$  and petroleum ether, or better still by recrystn. from  $\text{HCO}_2\text{Et}$ . A new color reaction is obtained by treating cantharidin with a reagent consisting of 10 g.  $\text{H}_2\text{SO}_4$ , 5 g.  $\text{CrO}_3$  and 5 cc.  $\text{H}_2\text{O}$ . After a few hours thin green streaks are observed, and finally the mixt. takes on a yellowish green color.

A. W. DOX

**Commentaries on the new Argentine Pharmacopeia. I. Official fixed and volatile oils.** C. A. GRAU. *Rev. facultad cienc. quim.* **1**, 107-48 (1923).—The comments are for the most part suggestions regarding standards of acidity and sp. gr., and the adoption of more recent methods of assay which are given in detail. It is recommended that in all the medicated oils liquid paraffin or vaselin oil be used as a vehicle in place of olive or almond oil to avoid acidity. Where a vegetable oil is required for external use the domestic peanut or rape oil would be preferable on account of lower acidity. For oil of henbane a more complete extn. could be made by first treating the leaves with  $\text{EtOH}$  and  $\text{NH}_4\text{OH}$ , then extg. with  $\text{Et}_2\text{O}$ - $\text{EtOH}$ , adding this tincture to the vegetable oil and evapg. the  $\text{Et}_2\text{O}$ . Oils dropped from this edition are wintergreen and ozonized turpentine, and those added are bitter almond, cajeput, camomile and mustard. For a future edition essence of rue, wormwood and bergamot are recommended, also the replacement of essence of rose by essence of geranium.

A. W. DOX

**Boerhaavia repens.** J. N. RAKSHIT. *Analyst* **48**, 169 (1923).—This plant, growing in almost every part of India, is a valuable remedy for dropsy. The dried roots on the one hand and the stems and leaves on the other were examd.: moisture 11.5 and 13.0, ash 10.5 and 18.9,  $\text{H}_2\text{O}$ -sol. material 31.0 and 11.0, sol. in 1%  $\text{NH}_3$  23.0 and 11.5,  $\text{HCl}$ -sol. 44.0 and 27.0, sol. in 90%  $\text{EtOH}$  9.0 and 11.0, sol. carbohydrates before inversion (as invert sugar) 1.6 and 1.4, total sol. carbohydrates after inversion (as invert sugar) 4.1 and 3.2, insol. carbohydrates as starch 35.6 and 17.2%, resp. All parts of the plant contain alkaloids, the roots showing the least amt.

W. O. E.

**Essential oil of Kunzea corifolia.** F. R. MORRISON. *J. Proc. Roy. Soc. N. S. Wales* **56**, 201-5 (1923).—This oil, obtained in an av. yield of 0.35% from the leaves and terminal branchlets, consists principally of *d*- $\alpha$ -pinene, together with small quantities of acetic and butyric esters, and an unidentified alc. to which latter the characteristic fragrant odor of the oil is due.

W. O. E.

**Essential oil of Eriostemon crowei (Crowea saligna) and the presence of a new phenol ether.** A. R. PENFOLD AND F. R. MORRISON. *J. Proc. Roy. Soc. N. S. Wales* **56**, 227-32 (1923).—The crude oil, obtained in a yield of 0.4%, is bright yellow, heavier than  $\text{H}_2\text{O}$ , highly refractive, and has a characteristic odor resembling safrol. The principal constituent (occurring to the extent of 90%) is a phenol ether, for which the name "croweacin" is proposed, having the formula  $\text{C}_{11}\text{H}_{12}\text{O}_4$ , 1  $\text{CH}_3\text{O}$  group, and general characters apparently related to safrol. Although optically inactive, the oil is resolved on fractional distn. into a mixt. of the inactive phenol ether, with both *d*- and *l*-rotatory substances, which together neutralize one another as regards optical activity. Two preps. of croweacin possessed the following characters:  $b_{\text{ref}}$  256-8";  $b_{\text{D}}$  130-1 and 130-2";  $d_{15}$  1.1339 and 1.1298;  $n_{\text{D}}^{20}$  1.5330 and 1.5328. Exptl. evidence points to the phenol ether possessing an allyl or propenyl side chain similar to substances like safrol,

elemicin, etc. Minor constituents of the oil include a *d*-sesquiterpene and a paraffin m. 64–5°. W. O. E.

**Economic utilization of the residues from the steam rectification and the germicidal values of the crude oil and the pure "active" constituents of the essential oil of *Eucalyptus cneorifolia*.** A. R. PENFOLD AND R. GRANT. *J. Proc. Roy. Soc. N. S. Wales* 56, 219–26 (1923).—The crude mobile black oil had the following approx. compn.: australol (phenol) 6.5%, cuminal and phellandral 5%, cryptal 18%, sesquiterpenes, sesquiterpene alcs. and polymerized substances. The crude oil is shown to have a high germicidal value in suspensions of 7% neutral soap soln., the phenol and aldehydes being the active germicidal agents. W. O. E.

**Essential oils of two species of *Homoranthus*, and the occurrence of ocimene.** A. R. PENFOLD. *J. Proc. Roy. Soc. N. S. Wales* 56, 193–201 (1923).—The essential oils herein detailed were obtained from the leaves and terminal branchlets of *H. Virgatus* and *H. flavescens*, in av. yields of 0.7 and 0.55%, resp. That from the former contained as the principal constituents up to 80% of *d*- $\alpha$ -pinene, the balance consisting largely of a sesquiterpene identical with those isolated by P. from other myrtaceous oils, with small amts. of AmOH, isovaleric aldehyde, and a paraffin m. 65–6°. The oil from *H. flavescens* was particularly mobile, having a characteristic odor contg. up to 80% of the olefinic terpene ocimene, some *d*- $\alpha$ -pinene and sesquiterpene, together with small amts. of AmOH and its acetic and butyric esters. W. O. E.

**Cultivation of drug plants in Austria.** WALTER HECHT. *Pharm. Monatshefte* 4, 29–33 (1923).—An address. W. O. E.

**Principles for the revision of a new pharmacopeia.** A. TSCHIRCH. *Pharm. Monatshefte* 4, 33–6 (1923). W. O. E.

**Testing and evaluation of drugs.** G. FROMME. *Pharm. Zentralhalle* 64, 167–70 (1923); cf. C. A. 17, 1531.—Certain changes in analytical tests involving balsam of Peru, ipecacuanha root and mustard seed are described. W. O. E.

**Saffron adulterations during the past 25 years.** A. NESTLER. *Pharm. Zentralhalle* 64, 148–51 (1923). W. O. E.

**Non-environmental factors influencing the alkaloidal content and yield of latex from the opium poppy.** H. E. ANNETT, H. D. SEN AND H. D. SINGH. *Mem. Dept. Agric. India* 6, 1–60 (1921); *Botan. Abstracts* 11, 667–8.—The content of morphine, codeine, and narcotine in the latex and its yield obtained at different lancing and by different methods of incision are compared. The opium obtained at 1st lancing of a poppy capsule is richer in morphine than that of successive lancing. H. G.

**The determination of thymol in Spanish oil of thyme.** HUGO MASTBAUM. *Anales soc. españ. fis. quim.* 20, 501–4 (1922).—The phenols are extd. from the oil by shaking out with several portions of 5% NaOH soln. On addn. of strong HCl to an aliquot part of the ext. the phenols separate as an oil which crystallizes on standing. The crystals are strongly pressed between filter paper several times and weighed. L. E. GILSON

**The crystalline form of atoxyl.** G. GILTA. *Bull. soc. chim. Belg.* 31, 211–3 (1922).—Detailed measurements of the crystals were made to obtain a rapid method of distinguishing between this substance and Na diaminodiphenylarsinate. Monoclinic, *a:b:c* = 2.481:1:0.963,  $\beta$  = 97°40'. The work of Melon (*Bull. acad. roy. Belg.* 1922, 50) is criticized. J. C. S.

**Bark of *Securidaca longepedunculata* (Polygalaceae).** FABRÈGUE. *Bull. sci. pharmacol.* 30, 16–7 (1923).—This plant from Africa is used by the natives as a *textile* and for *medication*. When fresh it has the odor of wintergreen. The external surface of the dry bark is pale orange in color, the internal surface nearly white and fibrous. The odor is aromatic and nauseous, very different from that of the fresh bark. The taste is sweetish, then bitter. A glucoside was pptd. by Pb(AcO)<sub>2</sub> from an aq. maceration of the bark previously plunged in 95% boiling alc. After sepn. of the Pb the liquid was evapd. at low temp. and the residue taken up with CHCl<sub>3</sub> from which the glucoside was pptd. by the addn. of Et<sub>2</sub>O. It is a whitish amorphous powder very sol. in water but insol. in Et<sub>2</sub>O, alc. or benzene. The aq. soln. is acid and gives on shaking a froth which persists for several hrs. The glucoside is pptd. by Ba(OH)<sub>2</sub>. By boiling with dil. acid the glucoside yields a reducing sugar and a saponigen insol. in H<sub>2</sub>O but very sol. in Et<sub>2</sub>O, the soln. on evapn. yielding fine white needles. The bark also contains 1.3 to 1.5% of reducing sugar (calcd. as glucose), about 0.2% of a yellowish fat, very small amts. of a yellowish brown resin, a yellowish material which turns green with alkalis and minute amts. of substances having a disagreeable odor, and contg. perhaps valerianic acid. It is proposed to name the glucoside *securidaca-sapomin*. L. W. RIGGS

**Double iodide of emetine and bismuth.** MOREAU and ISNARD. *Bull. sci. pharmacol.* 30, 129-33(1923).—Soln. (1) is a 2% aq. soln. of emetine hydrochloride. Soln. (2) is prepd. by the addn. of 8.63 g. of Bi carbonate (contg. 6.842 g. of Bi) to 100 cc. of warm water. The mixt. is placed on the water bath and while warming HCl is slowly added until the Bi carbonate is dissolved when a soln. of  $\text{NH}_4\text{I}$  (33 g. to 60 cc. of water) is added to the Bi soln. and made up to 200 cc. in a graduated flask. Soln. (1) is brought to boiling and soln. (2) is slowly added from a buret until the liquid from the ppt., which is at first colorless, turns yellow indicating an excess of the precipitant. The ppt. is collected on a smooth filter, dried in the air, then washed with water added in very small amts. until the washings, at first yellow, become almost colorless. The washing should be stopped at the moment when the filtrate is pptd. by the addn. of a drop of the Bi soln., indicating that all of the latter is removed from the ppt. and the excess of water begins to dissociate the double iodide. The ppt. was dried at  $100^\circ$ , was weighed on the filter and yielded 4.7 g. of the double iodide. From the amts. of emetine and Bi in the reagents used, the compn. of this ppt. may be calcd. The results were Bi 18.2, emetine 30.63, I and H by difference 51.17%. Analysis of the ppt. gave Bi 18.22, emetine 30.8, I 51.17, H and loss 0.81%, corresponding to the formula emetine.2HI.1.5BiI<sub>2</sub>. It is a brick-red powder, stable at  $100^\circ$ , decomposes above  $100^\circ$ , hygroscopic, dissociated by  $\text{H}_2\text{O}$ , insol. in the common org. solvents, sol. in acetone, the soln. on evapn. yielding red transparent scales. It is sol. in HCl; dil. NaOH removes I and leaves emetine and Bi oxide. If 0.5 g. of the substance is added to 200 cc. of  $\text{Na}_2\text{CO}_3$  soln. (0.5%) and allowed to stand 24 hrs. with occasional shaking, the I and emetine pass into soln., the residue consisting of Bi oxide and traces of oxyiodide. After a second similar treatment the double iodide is completely dissociated. The employment of this drug in gelatin capsules insures its slow absorption in the intestines. L. W. RIGGS

**Characterization and analysis of bismuth gallate.** ANDRÉ LÉVÊQUE. *Bull. sci. pharmacol.* 30, 133-5(1923).—As this drug is not sufficiently described in the French Codex, L. gives with minute detail the qual. and quant. reactions for gallic acid and for Bi, also the procedure for the detn. of Bi gallate in dermatol. L. W. RIGGS

**Thymol plants.** G. BLAQUE. *Bull. sci. pharmacol.* 30, 201-11(1923).—Methods for the detn. of the total phenols and of thymol in essences are given. The creation of a small thymol industry in France is suggested. Of the plants listed in the following table all but *Carum copticum* are of the order Labiatae:

	Habitat.	Part used.	Yield of essence.	Total phenols in essence.	Cryst. thymol in essence.
<i>Carum copticum</i> Benth.....	India	Seeds	3.5%	...	47.5%
<i>Thymus Zygis</i> L.....	Spain	Flowered plant	1.04	74.1%	51.
<i>Thymus capitatus</i> Hoffm. and Link..	Spain	Flowered plant	1.03	64.	?
<i>Thymus Broussonnetii</i> Boiss.....	Morocco	..	0.88	57.	?
<i>Thymus vulgaris</i> L.....	France	..	0.45	..	25.
<i>Ocimum gratissimum</i> L.....	Ivory Coast	Leaves and stalk	0.6	56.	39.
<i>Ocimum viride</i> Wild.....	Seychelles	Leaves	0.45	..	32.
<i>Mosla japonica</i> Maxim.....	Japan	Terminal flowers	1.3	..	50.
<i>Monarda punctata</i> L.....	U. S.	..	0.35	73.	64.
<i>Cunila Marina</i> L.....	U. S.	Entire	0.7	40.	?
<i>Salureia Thymbræ</i> L.....	Spain	..	..	..	19.
<i>Origanum vulgare</i> L.....	Sicily	Flowered plant	1.1	..	50.
<i>Origanum hirtum</i> Link.....	Dalmatia	Entire	3.3	66.5	55.
<i>Origanum Maru</i> L.....	Syria	..	..	64.	..
<i>Origanum floribundum</i> Munby.....	Algeria	..	..	..	25.

L. W. RIGGS

**The evaluation (determination of alkaloid content) of Java coca leaf, and the extraction of coca leaf in bulk.** A. W. K. DE JONG. *Ber. Afdel. Handelsmuseum, Kolonial Inst.* No. 9, 10 pp.(1922).—After the acidity of a sample of coca leaf has been detd. by titration with  $\text{Ba}(\text{OH})_2$ , a slight excess of an approx. 0.05 N, standardized soln. of  $\text{NH}_3$  in  $\text{C}_2\text{H}_5$  is added to 50 g. of coca leaf in a 750 cc. flask contg. enough more  $\text{C}_2\text{H}_5$  to make 600 cc. in all, after the  $\text{NH}_3$  soln. is added. This mixt. is kept at  $55^\circ$  in a water bath for 1 hr. with frequent shakings, and then the leaf is extd. at about

50° by being placed in a separatory funnel whose stem passes into a flask through a two-holed stopper, a second tube (well heat-lagged) running from the flask up past the funnel and being connected to the top of a coil condenser which delivers into the separatory funnel through a stopper in the top of the funnel. By heating the flask and keeping the cooling water in the condenser at 50–55°, a supply of  $C_6H_6$  at the proper temp. is continually dropping upon the coca leaf mass in the funnel, which is also well lagged. The extn. is continued 10 to 15 hrs. or until no more alkaloid is found in the leaf mass after extg. for 3 hrs. with fresh  $C_6H_6$ . The soln. is then filtered through a suction filter and is shaken with 10, 5, and 5 cc. of 2 *N* HCl in a separatory funnel. The thick emulsions thus formed are run into a 100 cc. flask and the  $C_6H_6$  carried down is evapd. off in a water bath. The HCl soln. is then cooked in an oil bath for 1 hr. with a reflux condenser. After cooling, the soln. is filtered into a tared 25 cc. volumetric flask and  $H_2O$  added to make 25 cc. The light-brown soln. is decolorized by the addn. of a small amt. of "Norite" and filtering with suction after which the HCl-ecgonine content is detd. by measuring the power of rotation in a 20 cm. tube. This method gives very uniform results, and 0.875% HCl-ecgonine against 0.790% by the old method. When extg. in bulk the  $C_6H_6$  is distd. off after the extn. is complete, and  $H_2O$  is added to the residue. After the last traces of  $C_6H_6$  have been evapd., the  $H_2O$  soln. is cooked for several hrs. in a reflux condenser until lye will not form a ppt. in a sample of the soln. The cocaine has then all been changed to ecgonine. After cooling, the soln. is filtered and evapd. to a sirup which is ready for transportation and speedy crystn.

C. C. VAN VOORHIS

**Simple process to prevent coloration of novocaine-adrenaline solutions for spinal anesthesia; of novocaine, salts of eserine, apomorphine, emetine, etc., and the sterilization of these solutions.** M. BRIDEL. *J. pharm. chim.* 27, 166–78(1923).—To prevent coloration of the easily oxidizable solns. of the substances named, also of *Na salicylate*, use as solvent  $H_2O$  contg. 0.2%  $BzOH$ , and add to the solns. not more nor much less than 3 cc. per l. of soln. of  $NaHSO_3$ .  $BzOH$  neutralizes any alkali imparted by the glass, and its acidity enables the  $NaHSO_3$  to bind the O which would cause coloration of the solns. Besides, the solns. so treated, may be sterilized in the autoclave at 100° for 20 min. without showing any coloration.

S. WALDBOTT

**Assay of tricalcic phosphate.** E. LUCE. *Pharm. J.* 27, 214–6(1923).— $Ca_3(PO_4)_2$ , when prepd. by the Codex formula and dried at 100°, does not contain more than 5%  $H_2O$  volatile at red heat. Most of the com. samples hold much more  $H_2O$ , due sometimes to the presence of  $CaHPO_4 \cdot H_2O$ , sol. in  $NH_4$  citrate. No  $NH_3$  has been found. L. recommends that the Codex adopt a test for the absence of  $CaHPO_4 \cdot H_2O$  and allow 8% loss in calcination after preliminary drying at 100°.

S. WALDBOTT

**Assay of bismuth subnitrate.** E. ISNARD. *J. pharm. chim.* 27, 216–7(1923).—A certain sample of Bi subnitrate when tested for As with Bougaull's reagent ( $H_3PO_4$ , French Codex), gave a positive result, but failed to show As with Cribier's (*C. A.* 16, 35) and Marsh's tests. The cause of this difference was traced to *Te* being present in the Bi salt; from HCl soln. of the salt,  $H_2SO_4$  on warming gave a ppt. of *Te*.

S. WALDBOTT

**Assay of sodium cresylate.** E. ISNARD. *J. pharm. chim.* 27, 217–20(1923).—No assay method of Na cresylate being given in the Codex, I. assays it by extg. with  $Et_2O$  and weighing. Dil. 100 g. with  $H_2O$ , add  $CaCl_2$  (2 g.) to ppt. resin soap, fill up to 150 cc., shake, allow to stand, then filter off 100 cc. Add excess of HCl, shake and ext. twice with 20 cc.  $Et_2O$ , decant each time, then shake the acid soln. with 10 g. NaCl before extg. again with 20 cc. and again with 10 cc.  $Et_2O$ . Unite all  $Et_2O$  solns., wash the solu. free from acid, dry with  $Na_2SO_4$  and filter. Distil at about 36° from an oil bath and allow the temp. to rise slowly; it becomes stationary at 80°; after this, stop when a sudden rise occurs and weigh the residue. Det. Na by adding to Na cresylate a definite excess of normal acid and titrating back the excess.

S. WALDBOTT

**General chemical examination of opotherapeutic powders.** R. FABRE AND H. PRÉNAU. *J. pharm. chim.* 27, 281–90(1923).—Powders of the pancreas, pituitary and thyroid glands, ovarin, etc., are subjected to com. treatment with NaCl,  $H_3BO_3$ , NaF, HCHO, to "preserve" them; or with lactose, sucrose, starch, dextrin, or talc,  $CaCO_3$ , etc. A scheme of analysis for the detection and detn. of these is given.  $H_2O$  should not exceed 6–8%, but is often 12–15%; NaCl above 4% indicates salting; as much as 24.57% was found in com. ovarin. Insol. ash above 5% indicates talc or  $SiO_2$  (52.26% in 1 sample); an alk., insol. ash above 5% points to  $CaCO_3$ . The av. ratio of sol. ash: total ash in ovarin is 53%; heparin 45%; thyroid gland 53%; pituitary gland 32%. The results of examn. of pure and adulterated powders are tabulated; the examn. for extraneous animal or vegetable matter was not considered.

S. WALDBOTT

**The Codex test for ethyl chloride.** A. RICHAUD. *J. pharm. chim.* 27, 329-32 (1923).—The Codex test for absence of Cl ion in EtCl is ambiguous. R. recommends that AgNO<sub>3</sub> soln. be added to EtCl previously dild. with 4-5 vols. of EtOH (U. S. P. requires 20 vols.). S. WALDBOTT

**Hydrolysis of xanthylated derivatives of veronal and the hypnotics of the barbituric series; its importance in toxicology.** R. FABRE. *J. pharm. chim.* 27, 337-9 (1923).—By hydrolysis of the dioxanthylated compds. (C. A. 16, 4299) veronal and similar hypnotics are easily recovered in pure state and in almost quant. amts. Hydrolyze by warming the compds. at reflux for 1 hr. with 20% alc. HCl, pour into H<sub>2</sub>O, render alk. with 10% NaOH, ext. the decompn. products of xanthidrol with Et<sub>2</sub>O, then render acid and ext. veronal, etc., with Et<sub>2</sub>O. Evap. and identify by m. p. and chem. and physiological tests. S. WALDBOTT

**The new remedies of 1922.** TH. STEPHENSON. *Pharm. J.* 110, 82-8 (1923).—New antisypilitics, anesthetics, antiseptics, org. Sb compds., cinchona alkaloids and derivs., new hypnotics, chlorophyll and hemoglobin, insulin, isopropyl alc. are considered. S. WALDBOTT

**Florida arrowroot, from *Zamia floridana*, A.D.C.** T. E. WALLIS. *Pharm. J.* 110, 225-8 (1923).—A specimen of the plant yielding Florida arrowroot was received from J. K. Small who ascribed it to *Zamia floridana*, A.D.C. (*J. New York Botan. Garden*, 22, 121-37 (1921)); still, its identity with DeCandolle's specimen in Geneva remains to be proved. It is probably not identical with *Z. integrifolia*, Ait., to which *Zamia* starch examd. by Reichert (C. A. 9, 1071) was referred, this view apparently being adopted by Clevenger (cf. C. A. 17, 223) and Viehoever (C. A. 17, 154). The source of Reichert's starch remains unknown. Com. Florida arrowroot and that of Small's specimen are described and sketched, and shown to be identical, the presence of typical CaC<sub>2</sub>O<sub>4</sub> crystals being a useful new means of confirmation. S. WALDBOTT

**Opium powder; loss of morphine on keeping.** I. D. B. DORR. *Pharm. J.* 110, 241 (1923); cf. C. A. 16, 4300.—Only in 1 of 4 samples of opium, slight loss of opium was noted when kept about 6 months. The sample was of inferior, damaged grade. S. WALDBOTT

**Note on a sample of opium from the growth of 1852-1853.** H. E. WATT. *Pharm. J.* 110, 241-2 (1923).—An old sample of "Candeish opium," "wt. 21.5 tollas" (251 g.), lost 10 g. (probably H<sub>2</sub>O only) in 70 yrs.; it contained 7.6% anhyd. morphine. This closely agrees with 45 yr. old results on similar samples in the Indian Museum. S. W.

**Phosphorus pills.** E. A. M. KNORR. *Pharm. J.* 110, 242 (1923).—The pill mass in Brit. Pharm. 1914 readily softens and melts in the hand; it cannot be kept under H<sub>2</sub>O, as it contains Na<sub>2</sub>SO<sub>4</sub>. K. suggests a mass that is easily handled and may be kept unchanged under H<sub>2</sub>O for months. Dissolve P (1 g.) in CS<sub>2</sub> (20 cc.), add the soln. to wool fat (30 g.) in a mortar, triturate these together and work into a mass with Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> (69 g.). In the presence of other ingredients, an equiv. amt. of Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> may be omitted. Or it may be replaced by kaolin (insol. in the gastric juice), but pill masses made with kaolin tend to crumble. No org. powder, e. g., licorice, should be used in presence of P. (Boa). S. WALDBOTT

**Easton's syrup.** E. A. KELLY. *Pharm. J.* 110, 242-3 (1923).—To insure uniformity of the product, the name "Easton's Syrup" should be made a synonym of the official Syrup of phosphate of iron, quinine and strychnine of the Brit. Pharm. To prevent crysln., dissolve the Fe in dild. H<sub>2</sub>PO<sub>4</sub> (1:1), filter and dil. with H<sub>2</sub>O to 20 ounces per gal. of final vol., dissolve the strychnine in the Fe soln., shake the quinine sulfate with 25 oz. of H<sub>2</sub>O and add an exactly sufficient amt. of Fe soln. to dissolve the salt; filter if necessary and add the simple sirup while stirring; finally add the remainder of the Fe soln. and fill up, e. g., to 1 gal. A few drops of H<sub>2</sub>PO<sub>4</sub> and care in storage (in small, amber-tinted bottles) will cause it to keep well. If the Fe-H<sub>2</sub>PO<sub>4</sub> soln. contg. a small amt. of H<sub>2</sub>PO<sub>4</sub> is kept on hand, the prepn. may be finished quite rapidly, and more so when strychnine-HCl is substituted for the free alkaloid. S. WALDBOTT

**Recollections of pharmacy.** W. A. TILDEN. *Pharm. J.* 110, 286-9 (1923).—An autobiography, with portraits. S. WALDBOTT

**Cascara sagrada.** E. M. HOLMES. *Pharm. J.* 110, 314 (1923).—A review of an official monograph (M. J. Davidson, Circular No. 13, Forestry Branch Department, Interior Canada), and a brief report by H. on the growth of *Rhamnus purshiana* in Britain. S. WALDBOTT

**Towards an international pharmacopeia.** V. COFMAN. *Pharm. J.* 110, 314-6, 331 (1923).—A plea for coöperation. S. WALDBOTT

**Chemical tests and standards of the Brit. Pharm. 1914, and their applicability to the administration of the Food and Drugs Acts.** C. E. CORFIELD AND P. A. W.

**Salt.** *Pharm. J.* 110, 359-63 (1923).—A plea for more definiteness in stating requirements. S. WALDBOTT

**Solubility of codeine hydrochloride.** D. C. WILSON. *Pharm. J.* 110, 363-4 (1923).—The soly. of this salt at approx. 15.5° is 1 in 28.5 parts of H<sub>2</sub>O. S. W.

**Incompatibility of theobromine sodium salicylate (diuretin) and theophylline sodium acetate (theocin) and analogous compounds with solution of ammonium acetate.** J. W. PLENDERLEITH. *Pharm. J.* 110, 364-5 (1923).—A fine white ppt. forms on mixing the loose mol. compd. NaC<sub>7</sub>H<sub>7</sub>O<sub>2</sub>N<sub>4</sub>·NaC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> (A) with soln. of NH<sub>4</sub>AcO because its constituent NaC<sub>7</sub>H<sub>7</sub>O<sub>2</sub>N<sub>4</sub> (B) is strongly ionized, i. e., alk. in aq. soln., hence sets free NH<sub>4</sub> from NH<sub>4</sub> salts, simultaneously pptg. theobromine. A also ppts. with NaHCO<sub>3</sub> and all other acid salts, with free inorg. or org. acids, and all alkaloidal salts. Similar ppts. take place with these substances when B is combined with Na<sub>2</sub>SO<sub>4</sub>, NaI, Na lactate, formate, citrate, NaBzO and NaAcO, or when Li displaces Na; finally when A is replaced by compds. of the isomeric theophylline. S. WALDBOTT

**Note on a petroleum emulsion.** A. MCCUTCHEON. *Pharm. J.* 110, 365-6 (1923).—A discussion as to the best method of making a permanent, uniform, creamy emulsion with liquid paraffin, NaBzO, Ca(H<sub>2</sub>PO<sub>4</sub>)<sub>2</sub>, gum Arabic, gum tragacanth, bitter almond essence and CHCl<sub>3</sub>-H<sub>2</sub>O. To overcome the high viscosity of the paraffin in the making of the emulsion, McC. warms it to 50° previous to mixing it with the gums in a warmed mortar. In discussion, RITCHIE recommends sep. soln. of the salts in the CHCl<sub>3</sub>-H<sub>2</sub>O, and first adding 1/4 of the menstruum to the cold-mixed triturate of gums and oil; after rubbing, add the soln. of the salts and the rest of the menstruum. S. W.

**Suspension of bismuth subnitrate.** W. S. GLASS. *Pharm. J.* 110, 366 (1923).—Gum acacia used in making a suspension of Bi subnitrate causes a hard cake to form at the bottom. Compd. powder of tragacanth acted slightly better, but powd. starch gave the best results. Finely divided Bi salt without a suspending agent is difficult to disintegrate by shaking after about 2 hrs. standing. In discussion, the danger of using starch in certain cases of dyspepsia is pointed out. S. WALDBOTT

**Pharmacopoeial studies.** L. KROEBER. *Schweiz. Apoth. Ztg.* 61, 49-53, 61-6, (1923).—Suggestions for the pending new editions of the German and Swiss pharmacopoeias, resulting from a crit. comparison, with numerous examples, of the present editions. S. WALDBOTT

**Opium as a sensorial drug.** L. REUTTER. *Schweiz. Apoth. Ztg.* 61, 66-9, 84-7 111-3, 126-7 (1923).—Historical account of opium, its cultivation and use in smoking. S. WALDBOTT

**Formaldehyde-soap solution (lysoform).** J. LANG. *Schweiz. Apoth. Ztg.* 61, 93-5 (1923); cf. *C. A.* 7, 360; 16, 3527.—Swiss lysoform is HCHO soap contg. 4% HCHO and about 20% of combined fatty acids. Expts. are desired to det. the min. HCHO content necessary for an efficient disinfectant, 4% being too low. S. WALDBOTT

**Somnifene.** HOFFMANN-LA ROCHE & Co. *Schweiz. Apoth. Ztg.* 61, 101 (1923); cf. *C. A.* 16, 2756.—The modified prepn. contains in 1 cc. the NHEt<sub>3</sub> salts of 0.1 g. diethyl- and 0.1 g. isopropylpropenylbarbituric acid. S. WALDBOTT

**Manipulative improvement in assaying official drugs containing caffeine or cantharides.** R. MAEDER. *Schweiz. Apoth. Ztg.* 61, 105-6 (1923).—Instead of filtering the extd. drugs floating on CHCl<sub>3</sub>, the solvent is blown upon the filter in wash-bottle fashion. S. WALDBOTT

**New microchemical alkaloid reactions.** L. ROSENTHALER. *Schweiz. Apoth. Ztg.* 61, 118-25 (1923).—The reagents used are: (a) Co(NO<sub>3</sub>)<sub>4</sub>(NH<sub>3</sub>)<sub>2</sub>K (cf. Ephraim, *C. A.* 15, 2027). The cryst. microchem. forms of the yellow ppts. obtained with 12 alkaloids are sketched. The strychnine compd. has the compn. Co(NO<sub>3</sub>)<sub>4</sub>(NH<sub>3</sub>)<sub>2</sub>C<sub>21</sub>H<sub>22</sub>N<sub>2</sub>O<sub>2</sub>. (b) Co(NO<sub>3</sub>)<sub>4</sub>Na<sub>3</sub>. Dissolve 2.0 g. Co(NO<sub>3</sub>)<sub>2</sub> and 2.5 g. NaNO<sub>3</sub> in 6.5 g. H<sub>2</sub>O and 1 cc. glacial AcOH; after the gas has escaped, add EtOH until pptn. is complete, wash with EtOH and dissolve in 10 cc. H<sub>2</sub>O. This reagent ppts. cryst. forms only with solns. of cocaine, tropacocaine and notably heroine (sketched). (c) PbCu(NO<sub>3</sub>)<sub>4</sub>Na<sub>3</sub>. Mix a soln. of Cu(AcO)<sub>2</sub> (0.5 g.) and Pb(AcO)<sub>2</sub> (0.5 g.) in 10 g. H<sub>2</sub>O with soln. of 2.5 g. NaNO<sub>3</sub> in 10 g. H<sub>2</sub>O. Most alkaloids give amorphous ppts.; no pptn. is obtained with colchicine, hydrastine, morphine (0.5% HCl soln.) and veratrine. Cryst. green ppts. are formed with brucine, cocaine (fails in presence of atropine), hydrastinine and pilocarpine (all are sketched), and strychnine. Sometimes colorless nitrates are pptd. (d) NaClO<sub>4</sub> (cf. Deniges, *C. A.* 11, 2309, 2648). Cryst. forms are shown with aconitine, brucine, hydrastinine and morphine, obtained by adding some grains of NaClO<sub>4</sub> to soln. of the alkaloids in 0.1 N HCl. S. WALDBOTT

• **Disodium mono-ethyl arsonate.** I. M. HUSSEY. U. S. 1,452,605, Apr. 24. Di-

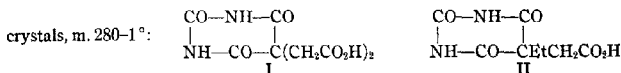


Na mono-ethyl arsonate is prepd. by treatment of an aq. suspension of Mg Et arsonate with NaOH. It forms white deliquescent crystals, sol. in  $H_2O$ , forming stable solns., and when exposed to the air in soln. for a long time decomposes into  $Na_2CO_3$  and ethylarsonic acid. It is adapted for therapeutic use in the treatment of trypanosomal and spirochaetal infections.

**Bacterial immunizing media and sera.** E. FRIEDBERGER. U. S. 1,448,290, Mar. 13. In prepg. immunizing preps. against typhus, tuberculosis, cholera, epidemic diseases of animals, etc., the bacteria are suspended in a physiol. NaCl soln., treated with a serum contg. amboceptor, maintained for several hrs. at the temp. of an ice chest and centrifuged. The resulting residue contg. amboceptor is lixiviated and a complement-contg. serum is added to the sediment, the mass is maintained at ice-chest temp. for several hrs., with intermittent shaking, and is then centrifuged to obtain a toxic liquid. The latter is not stable but may be dried at temps. below  $40^\circ$  to obtain a dry prepn. stable for some time in a dark desiccator. The dry substance may be heated to about  $100^\circ$  without losing activity although the liquid becomes inactive at about  $65^\circ$ . These preps. may be injected into animals for production of sera in the usual manner.

**Galactagog.** KENNOSUKE TAMAGAWA. Japan. 40,805, Nov. 29, 1921. A special stimulant in the placenta is extd. with a mixt. of NaCl 8.0, KCl 0.2,  $MgCl_2$  0.1,  $CaCl_2$  0.2,  $Na_2HPO_4$  0.05,  $NaHCO_3$  1.0, grape sugar 1.0, pyridine 0.1 and  $H_2O$  1000.0, satd. with  $O_2$  at  $39^\circ$ . The soln. is evapd. to dryness *in vacuo*.

**Derivative of barbituric acid soluble in water.** HERMANN STAUDINGER. Swiss 91,561. Diallylbarbituric acid or ethylallylbarbituric acid is treated with ozone and the ozonide is changed into the corresponding carboxylic acid. Diallylbarbituric acid gives a cryst. ozonide, which is decomposed by heating over a water bath with formation of a dicarboxylic acid (I), colorless crystals, m.  $280^\circ$  (decompn.). Ethylallylbarbituric acid gives similarly a monocarboxylic acid (II) which forms colorless



The compds. have therapeutic uses and serve as intermediates for the prepn. of other barbituric acid derivs. J. C. S.

**An ester of trichloroethyl alcohol.** FARBENFABRIKEN VORM. FRIDR. BAYER & Co. Ger. 358,125. The alc. is converted by the usual methods into the corresponding carbamate. E. g.,  $CCl_3CH_2OH$  dissolved in anhyd. ether is treated with carbamide hydrochloride, or the alc. dissolved in benzene in the presence of quinoline is treated with  $COCl_2$ , and the trichloroethyl chloroformate thus formed treated with  $NH_3$ . Trichloroethyl carbamate forms white needles, m.  $64-5^\circ$ . It is a soporific. J. C. S.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**Notes on the construction and equipment of chamber acid plants.** R. J. DONALDSON. *Chem. Eng. Mining Rev.* 15, 212-6(1923).—In planning the general arrangement it is recommended to have pumps and tanks on the ground level; chamber boots, drips, spray water filters and fan controls on the chamber floor level; Glover tower boots and coolers at a higher level; tower flow distributors and dampers at the tower top level; tower tanks above these and a gangway, connected either with the tower tank or distributor level by a bridge, for the adjustment of the sprays. The main building and chamber framework are best tied together with numerous cross braces, to give a structure rigid under wind pressure. There should be ample provision for ventilation under the chambers and around them, and the wooden floor under them should not be tongue and grooved, so that leaks may be easily spotted. Chamber curtains not over 20 ft. long may be hung from the crown, but if longer should be hung from horizontal straps fastened to girts. The curtain of the Glover tower is best bent up all around the bottom, and held in place by straps. The trough thus formed allows of air cooling the curtain immersed in the hot acid in the saucer. A special form of grooved packing brick is illustrated. The flues should be amply large, but it is better to have them a little small with easy bends than large with right-angle bends. The fan should be mounted on a foundation sep. from the chambers and the flues should be

connected with it through water or acid-sealed lutes to avoid vibration difficulties. A special form of acid cooler is illustrated, consisting of a no. of narrow lead envelopes hung closely side by side in a rectangular tank, with water inside them. Very low water and acid pressures serve to establish flow. The heat transfer coeff. through clean lead sheet is 40 to 45 B. t. u./sq. ft./hr./° F. temp. difference, but may drop as low as 15 with dirty surfaces. Each set of chamber sprays should have a meter on it. A home-made Venturi meter registering on an inverted U tube filled with water and kerosene is described in detail. This can be used on the sprays. F. C. Z.

**The British alkali industry.** ANON. *Chem. Trade J.* 72, 477-84 (1923).—A review of the industry from the time of the introduction into England of the Leblanc process in 1823 to the present. E. H.

**Magadi soda ash.** KURT JOHANNSEN. *Chem.-Ztg.* 47, 316 (1923).—Natural soda ash may again become industrially important. Magadi Lake in British East Africa, discovered in 1904, has been developed to a point where calcined soda ash of 98% purity is being produced at a low price and in large quantities. C. B. EDWARDS

**Production of hydrogen by the thermal decomposition of oil.** E. R. WEAVER. *Chem. Met. Eng.* 28, 764-8 (1923).—The first of 3 articles describing the design, construction and operation of an exptl. *modified water-gas plant* and its accessories in the production of H from fuel oil. Elimination of CH<sub>4</sub> from the H produced by this method depends upon decomp. the oil in contact with a large surface at a very high temp. Silica bricks are best for the checker-work in the tower whereby the blast gas is burned completely, later giving up its heat to the brick where it is available for use. The plant is illus. and data on exptl. operation using fuel oil and petroleum coke are shown on a curve. W. H. BOYNTON

**The automatic and continuous calcium nitride oven.** FREDRIK CARLSON. *Teknisk Tids.* 53, Kemi No. 2, 5-11 (1923).—A description illustrated by line drawings and photographs. A. R. ROSE

Tables of thermodynamic properties of NH<sub>3</sub> (ANON) 2. Hazards in gas compression (RISYRN) 24. Explosions in liquid air rectification plant (ORMANDY, et al.) 24.

**Purifying residues obtained in producing ammonia from cyanide.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,453,210, Apr. 24. The hydrolyzed residues obtained by the cyanide-forming reaction and production of NH<sub>3</sub>, including silicates and aluminates, are decompd. by CO<sub>2</sub> in order to avoid interference with the cyanide-forming reaction.

**Ammonium chloride from synthetic ammonia.** C. BOSCH, E. DEHNEL and C. KIRCHER. U. S. 1,453,060, Apr. 24. Synthetic NH<sub>3</sub> is employed in the ammonia soda process and NH<sub>4</sub>Cl is withdrawn from the by-product mother liquor by alternately concg., removing the NaCl sepd. and cooling to ppt. NH<sub>4</sub>Cl. The crude product obtained may be used as a fertilizer.

**Permanganates.** R. E. WILSON, L. W. PARSONS and S. L. CHISHOLM. U. S. 1,453,562, May 1. Ba manganate is treated with halogen, acid or CO<sub>2</sub> and the product thus formed is reacted upon by Ca(OH)<sub>2</sub> in order to obtain Ca permanganate.

**Calcium iodide.** TOMOZO MIZUTANI. Japan. 40,944, Dec. 2, 1921. CaI<sub>2</sub> is prepd. from CaCl<sub>2</sub> and NaI or KI. Satd. alc. solns. of CaCl<sub>2</sub> and NaI are mixed together in a closed vessel in the ratio of 1:2 mols. The vessel is kept *in vacuo* and heated at 50° for a few hrs. Pptd. NaCl is quickly filtered and the solvent is distd. off *in vacuo*. The concd. soln. is kept in a vacuum vessel in a dark place for the production of CaI<sub>2</sub>, the yield being about 10 g. from 20 g. of hydrated CaCl<sub>2</sub>.

**Machine for manufacturing slaked lime.** MASAKICHI NOSE. Japan. 40,903, Dec. 1, 1921. Diagrammatical.

**Furnace for preparing sodium chloride.** TOEMON KIRA. Japan. 41,054, Dec. 13, 1921. The furnace is so constructed that the broad surface of the crystg. pan is homogeneously and gently heated.

**Feeding apparatus for brine.** RIICHIRO TANAKA, KANEJIRO UEDA and JUNICHI KAMIRYO. Japan. 40,910, Dec. 1, 1921. Brine is dropped through a column of Hg, the height of which is changed according to the head of the brine in the tank; by this method the pressure upon the brine is always const., notwithstanding the head of the original brine is changeable.

**Nitrogen fixation.** C. H. BUETTNER. U. S. 1,453,435, May 1. Mixed N and O are subjected to an elec. discharge between a plurality of elec. terminals (each in an independent elec. circuit) and a body of H<sub>2</sub>O in which the fixation products are absorbed. Cf. C. A. 17, 1536.

**Fire extinguisher.** RINOSUKE CHIBA. Japan. 40,936, Dec. 2, 1921. A mixt. of 20%  $C_2H_5Cl$ ,  $C_2H_5Cl_2$ ,  $CCl_4$  or their mixt., absorbed in 20% kieselguhr, 20%  $(NH_4)_2CO_3$ , and 40% clay.

**Shoe polish.** J. H. T. OLSEN. U. S. 1,452,614, Apr. 24. A white shoe polish is made from gum arabic 2 oz.,  $H_2O$  2 qts., and Zn white 12 oz.

**Automobile polish.** G. A. COLETTE. U. S. 1,453,003, Apr. 24. Cider vinegar 2, olive oil 1 and corn oil 1 part.

**Brake lining material.** F. J. GLEASON. U. S. 1,452,555, Apr. 24. A cotton fabric is impregnated with a baking japan soln. contg. boiled linseed oil and a larger proportion of gilsonite asphaltum and a volatile solvent such as turpentine and petroleum naphtha and the material is treated with live steam under pressure to remove the solvent without carbonizing the fabric.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Glass manufacture.** C. S. FOX. *Bull. Indian Ind. & Labour* No. 29, 1-73(1922).—The glass industry and its possibilities in India are discussed, with 7 appendices including tables of imports and exports of glassware, local prices of raw materials and a directory of Indian glass firms. Native resources of the necessary raw materials are indicated and material is given to aid in locating prospective glass factories.

J. B. PATCH

**The production of colorless glass in tank furnaces.** W. E. S. TURNER AND A. COUSEN. *Pottery Gas.* 47, 568-70(1922); 48, 87, 89(1923); cf. C. A. 17, 1536.

J. W. HEPFLEWHITE

**Silica glass, its properties, history and manufacture.** GEORGES FLUSIN. *Le Verre* 2, 145-53, 171-7, 193-8, 217-21, 241-4, 266-73(1922).—A complete detailed review of the phys. and chem. properties of the allotropic forms of silica, with special reference to silica glass, to which is appended a bibliography of 130 references. The history covers the various mfg. companies in England, Germany, France, Switzerland and the U. S. A. The manuf. of silica glass considers the different types of furnaces (with cuts) used, and the making of semi-opaque and transparent varieties, also the silica glasses contg.  $ZrO_2$  and  $TiO_2$ . The devitrification of silica glasses, and their uses complete the series. Some 80 patents on silica glass are listed, together with 60 references on the silica glass industries, which seems to be complete to 1920.

LOUIS NAVIAS

**Phonolite in the glass industry.** H. KÜHL. *Sprechsaal* 55, 313(1922); *J. Soc. Glass Tech.* 6, Abstr. Sec., 171.—Phonolite, a natural rock, contains large amts. of alkali and alumina and about 2% iron oxide. Zsigmondy showed it to be usefully incorporated in glass designed to absorb strongly heat radiation, the absorption being due to  $FeO$ . Decolorization of the glass possible only when phonolite is added in very small amts.; when it was present to the extent of 20-25% a wine-bottle green color was obtained. The following batch: sand 604, soda ash 200, limestone 80,  $Ba(NO_3)_2$  60, boric acid 20, phonolite 350 kg. gave a glass contg. about 7% alumina. In a crucible it melted easily and rapidly, but the glass formed had too high a coeff. of thermal expansion to be used for illuminating ware. The color of the above glass was green, and this was modified to various beautiful tints by the following coloring agents: blue-green, Cu oxide 10, Ni oxide 1 g.; green, Cu oxide 10,  $K_2CrO_4$  8 g.; light blue, Cu oxide 10, Co oxide 1.5 g.; deep blue, Cu oxide 10, Co oxide 3-4 g. A deep green glass, easily melted and worked, was obtained from the following batch: sand 600, soda ash 200, limestone 80,  $Ba(NO_3)_2$  25, boric acid 30, phonolite 350, U oxide 6, pyrolusite 25 kg. A glass made from sand 80, salt-cake 40, limestone 25, witherite 2, phonolite 100, coal 8, S 2, iron filings (or sieved iron turnings) 4 kg. was completely black if viewed in sheets of 4-5 mm. thickness. K. suggested that a glass contg. phonolite would be suitable for the production of a copper-ruby color.

H. G.

**Mother-of-pearl imitation on glass and porcelain ware.** O. W. PARKERT. *Sprechsaal* 55, 505(1922); *J. Soc. Glass Tech.* 6, Abstr. Sec., 289-90.—Before treating the ware it is necessary to clean the surface thoroughly and free it from grease and dust. In one method of producing a mother-of-pearl effect, a coating bath was prepd. by softening gelatin in water, pouring off the latter, melting the gelatin on a water bath, and then stirring in a thin aq. cream of a mixture of  $ZnO$ , chalk, baryta, and white lead.

The glass or porcelain was coated with this mixt. and dipped into the least possible layer made by pouring a mixt. of 1 part of nitrocellulose, 75 parts of alc. (95%), and 20 parts of ether into water. The film, on drying, gave iridescent effects which were still more pronounced when benzene was added to the second bath. In place of the nitrocellulose bath, there could be used one of 10 parts of K silicate, 90 parts of water with the addn. of benzene. The effect was also obtained by first applying a gelatin soln. in which  $\text{NH}_4\text{Br}$  had been dissolved, drying, dipping the ware into  $\text{AgNO}_3$  soln., again drying, and finally coating with collodion soln. Gelatin could be replaced by clear resin varnish in the coating baths, but in such cases resin-sol. media were necessary in the baths for producing iridescence. In some cases, small amts. of an aniline color capable of producing a metallic sheen (as fuchsin), were employed. A fine, mirror-like sheen was obtained by combining the effect obtained with fish-silver essence with the effect produced by adding a common salt soln. to the gelatin, and, after drying, treating the coating with an aq. soln. of a Ti salt.

H. G.

**Effect of alumina in retarding the devitrification of glass.** K. KAMITA. *Pottery Gaz.* 47, 1369 (1922).—The expts. are confined to window glass. Alumina was added in progressive series from 0.0% to 5.0%. A definite increase in the devitrification temp. was obtained as the percentage of alumina began. A regular curve was obtained indicating that with 5% alumina, incipient devitrification set in above  $850^\circ$ . The expts. did not include the effect that alumina had upon the upper devitrification temp.

J. W. HEPPLEWHITE

**Devitrification caused upon the surface of sheet glass by heat.** Y. AMENOMIYA. *Pottery Gaz.* 47, 1369; *J. Soc. Glass Tech.* 6, 231-4 (1922); cf. *C. A.* 16, 3532.—Results of expts. with sheet glass show that devitrification takes place more and more rapidly as the temp. is increased within the zone of  $700^\circ$  to  $800^\circ$  and that this particular temp. range constitutes the danger zone in the drawing of sheet glass cylinders.

J. W. HEPPLEWHITE

**Glass-house refractories.** ANON. *Pottery Gaz.* 47, 727, 729, 731, 733, 735 (1922).—A lengthy discussion of failures in refractory materials for glass-house use. J. W. H.

**Improvements in the design of recuperative glass pot furnaces.** T. TEISEN. *Pottery Gaz.* 48, 89-92 (1923).—A description of a recuperative glass pot furnace of T.'s design. One of the advantages is increased security against leakages obtained by the crosswise arrangement of air channels in relation to waste-gas channels as well as an interlocking principle on which the tubes are made.

J. W. HEPPLEWHITE

**Silica glass or fused quartz.** ELIHU THOMSON. *Gen. Elec. Rev.* 26, 68-74 (1923).—The methods of making clear and opaque quartz objects are described. Extensive research at T.'s lab. has made it possible readily to obtain various shapes of the clearest material suitable for lenses, optical prisms, and reflecting mirrors. Its peculiar property of light conduction by internal reflection is used in internal treatment by ultra-violet rays. Its most valuable properties are high dielec. strength, low expansion coeff., and chem. inertness.

W. E. RUDER

**Silicate of soda in the ceramic industries.** J. G. VAIL. *Chem. Met. Eng.* 28, 636-7 (1923).—The ratio of  $\text{Na}_2\text{O}$  to  $\text{SiO}_2$  may vary from 1:1 to 1:4; it affects the shrinkage, strength and refractoriness of the ware. Air-dried solns. are hydrous and are dehydrated only at kiln temps. Loss of this combined  $\text{H}_2\text{O}$  reduces the bondings strength, which again develops at about  $2000^\circ\text{F}$ . To repair saggers use 1:2.4 ratio, 47% solid,  $52^\circ\text{Bé}$ . To bond abrasive wheels use 1:2 ratio, 54% solid. It is used also to deflocculate clay suspensions, make gas-tight joints, etc.

R. J. MONTGOMERY

**Removing iron oxide in the clay by means of chlorine gas.** YOSHIMASA ICHIKAWA. *J. Chem. Ind. (Japan)* 25, 1310-27 (1920).—Most Japanese clay contains too much Fe to be useful for best glass and ceramic industries. The clay used contained  $\text{SiO}_2$  70.99%, Fe (as  $\text{Fe}_2\text{O}_3$ ) 3.12%,  $\text{MgO}$  21.59%,  $\text{H}_2\text{O}$  2.42%, and others 1.88%. Of Fe, 1.21% was  $\text{FeO}$ , 1.26%  $\text{Fe}_2\text{O}_3$  and 0.3% silicate, 0.27%  $\text{SO}_4$ , and no metallic Fe. I. attempted without success to remove Fe oxide by elec. cataphoresis. An explanation for this failure is given. Expts. with Cl gas with the pure Fe oxide showed that no sublimation of  $\text{FeCl}_3$  occurred but the gas acted easily on metallic Fe, or Fe oxide plus charcoal. On this principle when the clay is heated at  $100$ – $110^\circ$  for 2 hrs., with a small amt. of charcoal, 70% of the total Fe can be removed. The amt. of charcoal is immaterial. Tables are given to show the relationship between temp. and % of Fe removed by heating for 1 hr., with and without charcoal, and the effect of time of heating on the amt. of Fe removed when heated at  $110$ – $115^\circ$ , and at  $300^\circ$ . Theoretical discussions of chem. reactions in the system  $\text{FeCl}_3 \rightleftharpoons \text{FeCl}_2 + \text{Cl}_2$  and the effect of temp. and pressure in this system are given in detail.

S. T.

**Rapid technical estimation of iron oxide and alumina in clays and in their products.**

FERNANDO LUCCHESI. *Giorn. chim. ind. applicata* 5, 12-4(1922).—Carefully wash the fresh ppt. of the hydroxides of Fe and Al obtained in the usual way until no more chlorides are found in the filtrate. Place filter and contents in a beaker and add from a buret a known excess of 0.5 *N* H<sub>2</sub>SO<sub>4</sub> (50 cc. of the acid for each g. material taken for analysis). Boil for about 10 min. Cool, add 2 drops of 0.02% Me orange, and titrate with 0.5 *N* NaOH until the red hue disappears. (Use for comparison an equal vol. of acidulated H<sub>2</sub>O colored with 2 drops of Me orange.) Do not continue toward the yellow, but stop at the point of change. Calc. by difference the acid combined with the 2 oxides. Add to the soln. 1 cc. concd. H<sub>2</sub>SO<sub>4</sub>, reduce with H<sub>2</sub>S and in the same beaker est. the Fe with 0.1 *N* KMnO<sub>4</sub>. The filter paper present does not appreciably affect the results, which are satisfactory, with the advantage of very rapid execution.

ROBERT S. POSMONTIER

The swelling of sand upon absorption of moisture and its effect upon batch mixing. L. E. NORTON. *Pottery Gaz.* 47, 1371-2(1922).—Addn. of 2% of H<sub>2</sub>O caused an expansion in the vol. of sand of no less than 12.4% and in some cases the max. increase in vol. was reached when but 1% of H<sub>2</sub>O was added. Hence measurement of sand by vol. cannot be considered trustworthy if a batch mixt. of accuracy is desired.

J. W. HEPPLEWHITE

The manufacture of quartz goods. W. SCHUEN. *Keram. Rundschau* 44, 457 (1922); *J. Soc. Glass Tech.* 6, Abstr. Sec., 271-2.—Pure quartz sand, quartzite or rock crystal was melted in an elec. furnace and the molten material shaped by drawing, pressing, or blowing. If heated to a mobile state quartz or highly siliceous compds. volatilized rapidly, and hence absorbed much heat. Another difficulty arose in the working owing to the fact that quartz had a small sp. heat and a low heat cond., which caused layers and streaks owing to the surface setting too rapidly. Further difficulties arose since soft or liquid quartz was capable of dissolving almost any substance. Many substances, e. g., SiC, only dissolved in liquid quartz to be pptd. on cooling. In the manuf. of quartz goods in an elec. furnace, SiO<sub>2</sub> was volatilized and reacted with the C resistor, which was at about 2000°, with formation of SiC and CO. To minimize this reaction, pure C should be used; in particular the C should be free from Na and K salts. S. carried out a series of exptl. meltings of a charge contg. 23 kg. of sand, together with 20-100 g. of oxides or sulfates of Al, Co, Ba, Sr, Sn, Zn, Fe, Cu, Co, Pb, P, Sb, or Cr, or, again, SiC, sugar, and wood charcoal. In no case did the oxides alloy themselves with the SiO<sub>2</sub>, and they were deposited on cooling giving a brittle product. All the sulfates were more capable of alloying, probably because they were all completely decomposed at the temps. used. Hence they had no adverse effect on the fused quartz goods. Addn. of Fe in various forms gave truly characteristic results. Fe oxide gave a brown, friable, brittle, unusable product. Fe sulfate gave a green, very strong product. Fe filings gave a product contg. many black specks but of good strength. SiC sugar, and charcoal in minute amts. gave a product contg. bubbles throughout and quite unusable. Somewhat larger amts. gave a very frothy product resembling pumice-stone. The latter was crushed and remelted, but gave an unusable, "seedy" product. The best results were obtained with rock crystal from Norway and Switzerland. Sand contg. minute white quartz fragments, in addn. to clear grains, such as Dorenttruper sand, gave a bubbly product. Sand which was washed in iron worm plants, from which the matted fragments and minute grains were washed out, gave almost clear products, which, however, contained very many black specks from iron derived from the washer. Quartzite was seldom pure enough, and, moreover, collected iron during its crushing. The mother-of-pearl luster on the surface of quartz goods was due to many extremely minute bubbles, derived from air absorbed on the sand grains or quartz fragments which could not escape from the viscous mass. Hence the more transparent the product the larger and the more cryst. the sand used.

H. G.

Chemical porcelain. G. WHITE. *Pottery Gaz.* 47, 566-7(1922).—Chem. porcelain being a supercooled liquid, W. advances the theory that fracturing is the result of devitrification or an attempt at crystn. under stress. In Worcester mixes, max. crystn. occurred in a burning of 84 hrs., of which 30 hrs. consisted in heating from 1300° to 1400°. In this period max. production of sillimanite occurred, advancing devitrification to a limit at which liability to further crystn. was sufficiently removed to make a high-grade chem. porcelain. A method for measuring the degree of crystallinity and heat change resistance is needed badly to attack the problem adequately.

J. W. HEPPLEWHITE

The burning of porcelain. G. H. BROWN. *New Jersey Ceramist* 1, 204(1921).

C. W. FARMELEE

The crazing of English earthenware. H. ELWOOD. *Pottery Gaz.* 48, 104-6(1923).—

E. considers most crazing of earthenware bodies due to variations in body compn. Eighty bodies were made and dipped in a standard glaze. All bodies were glost-fired at cone 01, and the biscuit firing was varied as follows: cones 04, 01, 2-3, 3-4, and 8-9. For this work the glaze used had the compn., 0.070  $K_2O$ , 0.233  $Na_2O$ , 0.400  $CaO$ , 0.290  $PbO$ , 0.251  $Al_2O_3$ , 3.164  $SiO_2$ , 0.402  $B_2O_3$ . E. concluded that the best compn. for a safe body was 71.10  $SiO_2$ ; 19.50  $Al_2O_3$ ; 3.97 bases, 5.42 loss on ignition. The body was safe in firing range from cone 01 to cone 9, the porosity varying from 27.63 to 2.25%. The recipe for the body is 40 clay, 50 flint, and 10 feldspar. With a normal variety of flint and a mixed Cornish stone in place of the feldspar the batch is 26 ball clay, 22 china clay, 19 stone and 33 flint. However, alteration of compn. of only one material in the mixt. may cause trouble. This was demonstrated by making up an earthenware body of definite compn., but using 64 different varieties of china clay. Fired at ordinary earthenware biscuit and glost temp. both crazing and peeling resulted.

J. W. HEPPLEWHITE

**Salt-glazing brick.** ANON. *Brit. Clayworker* 31, 356-7(1923).—The amt. of salt required varies with the clay, but with care 10 to 20 oz. per cu. ft. of kiln capacity will suffice.

H. G. SCHURECHT

**White glazes for red burning clays.** ANON. *Brick Pottery Trades J.* 31, 32-3 (1923).—High opacity is necessary in glazes to cover the red body of the ware. This opacity can be produced with  $SnO_2$ . To prevent glazes rich in  $SnO_2$  from peeling or crazing, the clay must contain at least 30%  $CaCO_3$ . For such clays the glaze must be fully matured at cone 05a. Two glazes are available, a raw glaze rich in Pb and a fritted glaze which is preferable because it is superior in quality. A raw glaze suitable for this purpose is: tin ashes 43, galena 32 and flint 25. Good fritted glazes are as follows:

Frit.	A.	B.	C.	D.	E.
Feldspar .....	32	..	..	..	7
Cryst. borax .....	27	..	..	..	..
Boracic acid.....	..	..	..	1	..
Whiting.....	6	..	8	..	..
Red lead.....	23	39	31	64	..
Flint.....	12	36	41	25	33
Tin oxide.....	..	9	14	..	..
Potash.....	..	16	..	..	..
Soda ash.....	..	..	6	..	14
China clay.....	..	..	..	10	6
Tin ashes.....	..	..	..	..	40

**Mill batch:**

Frit.....	100	..	100	100	..
China clay.....	7	..	13	4	..
Whiting.....	..	..	..	1	..
Red lead.....	..	..	..	1	..

Glazes A and D contain no Sn and are therefore less opaque than they might be, yet are suitable for purposes where great whiteness is not required. They are sufficiently fusible to enable one to add 10%  $SnO_2$  if desired.

H. G. SCHURECHT

**Zircon for white glazes.** P. P. BUDNIKOV. *Tonind. Ztg.* 47, 173-4; *Z. angew. Chem.* 36, 368(1923).—Sn is becoming too expensive and difficult to get for the production of opaque glazes.  $Sb_2O_3$  produces opaque glazes with good color and gloss.  $As_2O_3$  produces beautiful transparent white glazes and also opaque white glazes but they are not very durable and are destroyed by firing at high temps. A glaze contg. bone ash develops a scum on the surface. The best products are produced with cryolite. To get a better bond between the glaze and body small amts. of  $ZnO$ ,  $CaO$ , etc., are added. The glazes produced with Zr compds. are much more dependable. Five %  $ZrO_2$  gives a white opaque glaze. Still better results are obtained with a mixt. of  $SnO_2$  and a Zr prepn. By introducing  $ZrO_2$  in the glaze the m. p. is raised. When Sn and Zr are introduced as hydroxides they have a better covering power owing to the fact that the hydroxides are finer-grained. The following glazes were used: Glaze 1  $ZrO_2$  5,  $PbO$  3-4, kaolin 10,  $Na_2CO_3$  14,  $CaCO_3$  1,  $ZnO$  1,  $SiO_2$  35; Glaze 2  $SnO_2$  7,  $ZrO_2$  3,  $PbO$  32,  $SiO_2$  35, kaolin 10,  $Na_2CO_3$  12,  $ZnO$  1.

H. G. SCHURECHT

**Zirconium fluoride glazes and enamels.** FRITZ KRAZE. *Ber. deut. keram. Ges.* 3, 3(1922).—The best effect is obtained by fritting with fluorides, as this brings about the formation of  $ZrF_4$  and also the volatilization of the Fe as  $FeF_3$ . Ample time should be given during the fritting for the volatilization of  $SiF_4$ . An increase in  $ZrO_2$  produces

a more refractory enamel and a replacement of alkalis by  $ZrO_2$  has the same effect. If equal opacity is desired, with less  $ZrO_2$ , cryolite should be used as in the following: 0.728  $Na_2O$ , 0.243  $K_2O$ , 0.029  $BaO$ , 0.301  $Al_2O_3$ , 0.035  $Al_2F_6$ , 3.161  $SiO_2$ , 0.061  $ZrF_4$ , 0.067  $SiF_4$ . To this 0.058  $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$  is added in the mill. If overheated the opacifying agent  $Al_2F_6$  will also volatilize. If the  $SiF_4$  was insufficiently volatilized in fritting this reaction may take place later causing a mat enamel. A brilliant enamel was formed on the inside of cast Fe containers when fired upside down, but this brilliancy was lost when the enamel was washed with  $H_2O$ . If the enamel was fired, however, with the container right side up an equally bright enamel was produced which was also resistant to water and cold acids. This is explained as follows: In the first instance the volatilized  $SiF_4$  was trapped in the container and formed a highly alk. and sol. fluoride salt on the enamel. This type of enamel developed a remarkable elasticity on cast Fe and stood rapid temp. changes.

R. F. G.

**Slag action on refractory linings.** H. HIRSCH. *Tonind. Ztg.* **47**, 152-4(1923).—The influence of 9 different slags on different refractories was studied. The porosity of the brick is more important than the  $Al_2O_3$  content and the softening point. Brick made of fused clay (contg. 70%  $Al_2O_3$ ) was practically unaffected by slag action. Refractoriness is not important as long as the brick will stand the temp. of use. Brick to resist slag should have a softening point above conc 28, compression strength above 80 kg./per sq. cm.; the shrinkage upon reheating to conc 14 should be less than 2% and the brick should be dense and non-porous.

H. G. SCHURECHT

Electrical properties of flint glass of density 6.01 (ADDENBROOKE) 2.

**Apparatus for manufacturing glass bottles.** SADAJIRO KAWANO. Japan. 41,092, Dec. 13, 1921. Addn. to 36,982. Diagrammatical.

**Talc porcelain.** KOSUKE HIRANO. Japan. 40,863, Nov. 30, 1921. A mixt. of 25% talc, 30% talc previously fired at about 1,200°, 30% clay or kaolin, 10% feldspar and 5% magnesite, previously fired at 600-1200°, is used. Only one process of heating is sufficient. The addn. of magnesite is specially emphasized.

**Furnace for manufacturing tile.** TOKUNOSUKE HIRAHARA and CHUICHI ARIYOSHI. Japan. 40,772, Nov. 28, 1921. Diagrammatical.

**Cylindrical kiln of the "biscuit type."** R. J. DYER. U. S. 1,452,638, Apr. 24.

**Refractory material adapted for furnace linings.** I. P. KRAUS, JR. U. S. 1,453,468, May 1. Refractory material suitable for use in granular or molded form is prepd. by roasting a ground mixt. of bauxite, wood and glucose or other binder at such a clinkering temp. (below the m. p.) as to produce spongy grains free from cryst. structure.

**Enameling furnace.** F. C. MACKAY and J. H. GOMZ. U. S. 1,453,051, Apr. 24. The furnace has a refractory lining with a checkered surface, which serves to facilitate heat radiation to articles within the furnace and increase the durability of the furnace walls.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**Resistance to weather of building stone.** M. GARY. *Mitt. Materialprüfungsamt* **40**, 42-7(1922). J. S. C. I.

**The creosote treatment of sleepers.** W. KYNOCH and J. A. CODERRE. *Engineer* **135**, 144(1923).—The effect of preliminary incision on the preservation of railroad ties was investigated. With easily penetrable woods less creosote per cu. ft. and less time are required when incision is practiced. Hemlock, a refractory wood, was successfully treated after incision. An increased plant capacity and satisfactory penetration of every sleeper is made possible by incision. An incising machine is pictured and described.

D. B. DILL

**Ferro-concrete and its applications to gas-works construction (TWIST) 21.** Fire-proofing timber, etc. (Japan. pat. 41,008) 13.

**Coloring cement mortar.** F. M. HALDEMAN. U. S. 1,453,457, May 1. A finely ground insol. mineral pigment, e. g., Prussian blue, and  $CaCl_2$ , are mixed with the  $H_2O$  used for making mortar and incorporated with cement and aggregate before it has had time to settle.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The preparation, transportation and combustion of powdered coal. JOHN BLIZARD. *Bur. Mines, Bull.* 217, 127 pp. (1923).—See *C. A.* 16, 630.

Utilization of lignite coal. BANCROFT GORE. *Black Hills Eng.* 11, 85-126 (1923).—The lignite deposits of Western N. and S. Dak. and E. Wyo. contain about 1200 billion tons or more than  $\frac{1}{2}$  of all the known coal in the U. S. Analysis of the raw coal from the state mine near Haynes, N. Dak. shows moisture 31.93%, volatile and combustible matter 30.59, fixed C 28.77, ash 8.71, S 1.37, B. t. u. 7312. Drying raises the B. t. u. value to 10,744. The adaptation of this inferior grade of fuel to industrial and domestic uses is a distinctly engineering problem. Tests made at the State School of Mines of S. Dak. reveal interesting possibilities of upgrading crude lignite at the mine. The process recommended consists of crushing the run-of-mine coal to nut size, passing through a revolving drier, and screening to sizes suitable for domestic and steam purposes. Dust and buckwheat sizes are removed and used in unit pulverizers for firing the driers and boilers of the coal mine. The use of the smaller sizes of dried coal is suggested for gas producers, steam plants equipped with automatic stokers, locomotives and in connection with low-cost pulverizers adapted for grinding and blowing the lignite dust, either directly or indirectly, to combustion chambers of stationary boilers, locomotives, cement and lime kilns and industrial furnaces. Tests show very high combustion efficiency and high temps. in burning lignite dust; a temp. of 3000° F. is possible from dried lignite and 2800° F. from lignite contg. 26% of moisture. The upgrading process at the mine can be performed at a cost not to exceed 30 cents per ton and the product has a fuel value equiv. to 80% of that of eastern coal. Its cost in the consumers' bins is estd. at from  $\frac{1}{3}$  to  $\frac{1}{2}$  that of imported coal. The use of carefully sized and dried lignite in gas-producer equipped tractors and motor trucks is by no means a remote possibility to replace liquid fuels, while the use of crushed lignite in domestic heaters is proving satisfactory. Any process for improving the quality and phys. condition of crude lignite must be done at a very low cost, and little advantage pertains to processes yielding by-products difficult to market in thinly populated localities such as the lignite areas.

J. L. WILEY

Fuel requirements of internal-combustion engines. S. W. SPARROW. *Ind. Eng. Chem.* 15, 476-9 (1923).—S. discusses fuel from the standpoint of availability; usability as affected by explosive range, distn. range, latent heat of evapn., flash point, f. p., sepn. point, viscosity, detonation characteristics, spontaneous ignition temp., and corrosiveness; and power-producing ability.

J. L. WILEY

Developments in gas cookers. HAROLD HARTLEY. *Gas J.* 161, 835-8; 162, 32-5 (1923); *Gas World* 78, 289-92.—The chemistry of cooking is discussed and special preference is made to the "New World" cooker as a type offering the max. degree of thermal and domestic efficiency with low maintenance cost.

J. L. WILEY

Some economic aspects of the chemical constitution of coal. S. R. ILLINGWORTH. *Proc. S. Wales Inst. Eng.* 38, 499-528 (1922).—Various coals were heated at progressively higher temps., and the weight of volatile matter evolved at each temp. interval was noted (cf. *C. A.* 15, 2165) the results being considered in relation to Seyler's classification of coals and the C-H ratio. Bituminous and lignitic, but not carbonaceous and anthracitic, coals show a marked loss in weight below 500°. All coals evolve 6-8% of volatile matter over the range 600° to 900°, due to decompn. of the  $\alpha$ -compd. (cf. *C. A.* 14, 2413). The properties of a coal are detd. by a knowledge of the C-H ratio and of the action of solvents. Boiling phenol is the best solvent for the  $\beta$  and  $\gamma$  compds. The bituminous coals owe their properties to the presence of  $\beta$  and  $\gamma$  compds., and of each of these there are at least 4 types, of different thermal stabilities. Coking properties are absent from a coal when the  $\beta$  and  $\gamma$  compds. are of low thermal stability. The volatile matter evolved on heating an ortho-bituminous coal at 900° is given by the expression,  $27\beta/100 + 70\gamma/100 + 10$ . The expression for a meta-bituminous coal is  $27\beta/100 + 64\gamma/100 + 10$ . The ulmin compds., typical of the lignites, yield a large proportion of non-combustible volatile matter; hence a detn. of this and of the ash gives a measure of heating value. The  $\alpha$ -compd. probably contributes most useful heat in a furnace, since it is stable below 500° and yields CO and H at higher temps. Coal contg. unstable  $\gamma$ -compds. may not cake when burnt in thick layers, but when it is rapidly heated in thin layers its cementing properties may be exercised.

J. S. C. I.

The determination of volatile matter in coal and anthracite. D. J. W. KREVLIN. *Chem. Weekblad* 20, 225-9 (1923).—By using the Bochum method for the detn. of the



moisture and the volatile matter in 50 samples of coal K. finds that a difference exists between the % of volatile matter calcd. for dry coal from a detn. made with moist material, and the % directly detd. with dry material. This difference is greater the higher the moisture content; it is likely due to an action of  $H_2O$  and C, or to the better sticking together of the moist coal.

**Determination of degree of swelling of coal and porosity of coke.** J. GLOETZER. *Brennstoff-Chem.* 3, 344-5 (1922); cf. Lant, *C. A.* 16, 2400.—G. proposes to express the degree of swelling of coal in carbonizing by the expression (sp. vol. of coke  $\times$  coke yield)/(sp. vol. of coal  $\times$  100) — 1. For measurements of sp. gr. Smeeth's method (*Proc. Roy. Dublin Soc.* 6, 81 (1888)) is recommended, modified somewhat for apparent sp. gravities. A glass dish is used contg. paraffin wax with an inverted glass cone also filled with the wax standing inside the dish. The whole is weighed in air ( $w_1$ ). A weighed quantity of coke ( $w$ ) is introduced under the cone by a submerged opening, the wax being melted for the purpose. Bubbles of air which escape accumulate under the cone. If the glass and all contents are weighed under water ( $w_2$ ) the apparent sp. gr. is  $w/(w - (w_2 - w_1))$ . By powdering the coke the true sp. gr. can be obtained and thence the porosity.

**Aluminium retort for coal distillation with steam superheater combined.** H. SCHRADER. *Ges. Abhandl. Kennn. Kohle* 5, 65-8 (1920); cf. *C. A.* 15, 3201-2.—The path of the boring whereby steam is admitted is long enough to enable the steam to assume the retort temp. before admission to the charge.

**Methoxyl content of decaying vegetation.** F. FISCHER, H. SCHRADER AND A. FRIEDRICH. *Ges. Abhandl. Kennn. Kohle* 5, 530-40 (1920); cf. *C. A.* 15, 1610, 3548.—As the decay of wood progresses the cellulose rapidly disappears, while lignin accumulates and soly. in alkali increases, owing to the formation of humic acids. Ultimately at least 50% of the lignin originally present is converted into humic acids, which contain methoxyl groups, though some methoxyl groups are apparently lost in the process. In the Velen peat, as the depth increases, an increase is apparent in the methoxyl content of the portion insol. in strong HCl, of the portion sol. in NaOH, and of the bitumen. In the Lauchhammer peat the bitumen content and the portion insol. in strong HCl increase with the depth, but the methoxyl content decreases. In lignite deposits the methoxyl content increases with the age of the seam to a max., and thereafter decreases in the oldest strata.

**Behavior of cellulose and lignin during decay.** F. FISCHER, H. SCHRADER, A. FRIEDRICH AND A. SCHELLENBERG. *Ges. Abhandl. Kennn. Kohle* 5, 553-8 (1920); cf. preceding abstr.—In the Velen and also the Lauchhammer peat the portion sol. in strong HCl diminishes as the peat ages; the humic acids (sol. in alkali) increase in the Velen peat. The fall in the methoxyl content in the older specimens is to be explained by a splitting-off of methoxyl groups.

**Preliminary report of Canadian Peat Fuel Committee.** A. A. COLE AND B. F. HAANEL. *J. Am. Peat Soc.* 16, 45-51 (1923).—A statement of costs experienced in the trial plants, and the costs predicted for plants remodeled as recommended, also a brief statement of experience with various phases of the peat fuel proposition.

**The study of Spanish peat.** The peat deposits of the Gistral Mts. in the Province of Lugo. JOSÉ REIMUNDE BASANTA. *Anales soc. espan. fis. quim.* 21, 132-5 (1923).—The dried peat when extd. with  $C_6H_6$  yields 8.5-9.0% of a dark yellow montan wax which melts at about 80°. Subjected to destructive distn. the dry peat yields 40% of coke which closely resembles hardwood charcoal. The deposits vary from 1 m. to 5 m. in depth and are composed principally of the remains of several species of *Erioforum* and one species of *Carex*.

**The Florida Everglades.** ROBERT RANSON. *J. Am. Peat Soc.* 16, 55-9 (1923).—A discussion of the quality and quantity of peat in this region, and its use as fuel. There are 4,000,000 acres, averaging 8 feet in depth. Av. N content, 3.15%;  $(NH_4)_2SO_4$  per ton, 216 lbs.; B. t. u. at 17% moisture, 9000; gas per ton, 100,000 cu. ft. of 175 B. t. u.

**Bitumen content of peat.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennn. Kohle* 5, 1-33 (1920).—The yield of bitumen obtained by action of solvents depends on the source and age of the peat, the older beds in a given section giving the higher yields. In Soxhlet extns. the yields were considerably increased by the use of alc.-benzene mixts. or higher temps. Pre-drying the peat at 100° lowers the yield, which cannot be again increased to the original value by addn. of water to the dried sample. The exts. obtained by treatment with benzene in a Soxhlet app. resemble the bitumen from lignites. They are free from oil, whereas the exts. obtained above 150°

contain oil, which increases with the extrn. temp., and is therefore presumably a decompn. product. The alc. exts. are in general less fusible than the benzene exts. The ratio of benzene ext. to alkali-sol. portion seems to be a characteristic of an individual peat deposit. Exts. obtained at higher temps. and the above benzene ext. resemble each other in appearance. The yield of ext. does not increase further if the extrn. temp. is raised above 200°, though the residue decreases, owing to decompn. and the evolution of water and volatile products. J. S. C. I.

**Extraction of peat with phenol.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennn. Kohle* 5, 34-6(1920).—Peat, like coal, yields more ext. by treatment with phenol than with any other solvent, and the products had considerably higher m. ps. than the other extrn. products, which is to be ascribed either to a sp. solvent action of the phenol towards certain components or to a chem. action of the solvent. J. S. C. I.

**Influence of age of peat on the yield of tar.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennn. Kohle* 5, 94-105(1920).—Six samples of peat, three from Velen and three from Lauchhammer, were examd. Heated to 200° they yielded only traces of tar, which appeared first in measurable amt. at 250°. The younger peats gave less tar than the older. Some samples gave extraordinarily large yields. In spite of the high yield (18-28% of tar) furnished by air-dried Lauchhammer peats, the proportion of tar acids (13%) is relatively small. The paraffin content corresponds with that of Rhineland lignite. J. S. C. I.

**Action of solvents for cellulose on peat.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennn. Kohle* 5, 37-43(1920).—Samples of peat were treated with CS<sub>2</sub> and NaOH, Schweitzer's reagent, and ZnCl<sub>2</sub>, without any appreciable solvent effect occurring. The yields of insol. residue were not materially less than those obtained by treatment with alkali alone. J. S. C. I.

**Behavior of lignite and peat when treated with concentrated hydrochloric acid and distilled with dilute hydrochloric acid.** W. SCHNEIDER. *Ges. Abhandl. Kennn. Kohle* 4, 524-9(1920).—By the action of concd. HCl on various samples of lignite and peat, no hydrolysis to reducing sugar was observed, excepting with one lignite. Pentosans and methylpentosans, which are important constituents of plant substances, and can be detected in peat, were not found. J. S. C. I.

**Determination of the true moisture content of lignite.** G. A. BRENDER & BRANDIS AND C. J. VERGEEER. *Brennstoff-Chem.* 3, 353-5(1922).—The following results were obtained by different methods: (a) Methods based on loss in weight: dried in desiccator over CaCl<sub>2</sub> 49.75%; over H<sub>2</sub>SO<sub>4</sub> 51.91%; dried at 75° in open vessel 52.26%, at 75° in a weighing vessel 52.52%; dried at 100-5° 54.10%; dried in current of N at 100-5° 54.66%; dried in current of O at 100-5° 54.11%; (b) distn. methods: with petroleum to 155° 54.12% with xylene to 140° 53.72%; (c) methods in which moisture evolved is absorbed by CaCl<sub>2</sub> and weighed: dried in current of N at 100-5° 53.68%; dried in current of O at 100-5° 53.46%. The most reliable method is considered to be the extrn. by heating in a current of N at 100-5° and absorbing the moisture evolved in CaCl<sub>2</sub>. Check expts. showed that the increase in weight of the CaCl<sub>2</sub> tube due to condensation of hydrocarbons is negligible. For practical purposes it is sufficiently accurate to det. the loss in weight of a sample of lignite on heating at 104° in a current of N, though the results will be high on account of loss of CO<sub>2</sub> and H<sub>2</sub>S. J. S. C. I.

**Extraction of lignite with acetone.** W. SCHNEIDER. *Ges. Abhandl. Kennn. Kohle* 5, 46-8(1920).—Central German air-dried lignite, contg. 10.8% of moisture, gave on extrn. with acetone 7.5% of ext. resembling montan resin rather than montan wax. By extg. the residue, dried at 100°, with benzene, an additional 5.4% of ext. was obtained, whereas 14.2% was obtained by extrn. of the original substance with benzene in a Soxhlet app. Acetone is thus a less effective solvent for lignite bitumen than benzene, and the resinous constituents predominate in the ext. J. S. C. I.

**Behavior of bitumen B (from lignite) on protracted heating at 105°.** W. SCHNEIDER. *Ges. Abhandl. Kennn. Kohle* 5, 49-50(1920).—After being heated for 10 days at 105°, bitumen B from lignites, initially completely sol., was so altered that 55% became insol. in hot benzene. The original material contained C 75.94%, H 10.95%, and the portion insol. in benzene C 74.25%, H 9.38%, indicating absorption of O. Nevertheless a slight loss in weight had occurred, presumably due to loss of CO<sub>2</sub>, steam, or volatile S compds., or to condensation. J. S. C. I.

**A new fuel gas for the chemical industry.** ANON. *Chem.-Ztg.* 47, 316(1923).—Acetylene gas under high and very uniform pressures is recommended for lab. and industrial uses in connection with the Bunsen type of burner. A description is given of the "Weko" automatic acetylene generator which is especially designed to give large vols. of gas at pressures between 200 and 1000 mm. of water. C. B. EDWARDS

Alcohol as fuel and its production in Italy. GIUSEPPE MRZADROLL. *Giorn. chim. ind. applicata* 5, 125-8(1923).—The article treats of the economic aspects of the subject. Topics considered: The national fuel; alc. as fuel abroad; cheap basic materials for alc. in Italy; alc. from carob bean, pressed grape dregs and sugar beets; yields; alc. from molasses; alc. from figs.

ROBERT S. POSMONTIER

Net heat of carbonization of fuels and the distribution of the oxygen in the products of low-temperature carbonization. H. STRACHE AND E. FROHN. *Brennstoff-Chem.* 3, 337-40(1922).—In reckoning the heat evolved or absorbed in carbonization, as the liquid products are in the vapor state during the process, their latent heat of vaporization must be allowed for. For this purpose it is necessary to know quantitatively the way in which the elements are divided in the carbonization products. Samples of coal, lignite, and cellulose (cf. Strache and Grau, *C. A.* 15, 2349) were distd. at 550° and the products subjected to ultimate analysis. From Grau's figures for the gross heat of carbonization, and the data acquired, the net heat of carbonization could be calcd. and thence a curve showing its variation with the O content of the fuel. The results indicated that when the O content is less than 17%, heat is absorbed, while when it is greater than 17% heat is evolved in carbonization.

J. S. C. I.

Recovers fuel from slag and ashes. F. A. BRACKMAN. *Power* 57, 322-3(1923); illus.—The magnetic properties of ferric oxides to which are bound the silicates and lime of slag make it possible to sep. the slag from the combustible material by passing the mixt. through a magnetic field. Many plants are now in operation in Germany.

D. B. DILL

Combustion control for steam boilers. CHAS. S. SMOOT. *Power* 57, 354-5(1923).—Factors controlling the chem. union of air and fuel are discussed.

D. B. DILL

Fuel consumption of the different types of furnaces. W. TRINKS. *Fuels & Furnaces* 1, No. 1, 35(1923).—A table gives B. t. u. per gross ton heated and av. thermal efficiency for 18 types of furnaces.

D. F. BROWN

The Stein recuperative furnace. W. B. CHAPMAN. *Fuels & Furnaces* 1, No. 1, 41-2(1923).—A furnace is described which is claimed to save fuel consumption by preheating the air. A table is given showing the fuel saving effected by preheating air at temps. from 200° to 1900° F. and for different excesses of air.

D. F. BROWN

Economic aspects of motor-fuel supply from petroleum. F. W. LANE AND A. D. BAUER. *Ind. Eng. Chem.* 15, 479-81(1923).

J. L. WILEY

Alcohol as a motor fuel constituent. H. A. GARDNER. *Ind. Eng. Chem.* 15, 483-5(1923).—A mixt. of abs. alc. and purified gasoline (30:70) prepd. according to specifications will answer satisfactorily most of the requirements for aircraft fuel. Investigations are now in progress to det. the best methods of prepn., the phys. properties the effect on motor operation, etc., of such a mixt.

J. L. WILEY

Drying washed coal centrifugally. ANON. *Iron Coal Trades Rev.* 106, 491(1923); 3 figs.—The Simplex Continuous Centrifugal Coal Dryer is described. It is driven at 470 r. p. m. by a 25-h.p. motor. When dealing with its av. load of 20 tons of wet coal per hr., it requires from 16 to 21 h.p. for its operation. The av. moisture content of the coal is reduced from 20 to 9.5%.

J. L. WILEY

Coal tar as a source of fuel for internal-combustion engines. W. J. HUFF. *Ind. Eng. Chem.* 15, 485-8; *Chem. Age* (N. Y.) 31, 147-50(1923).—H. reviews the various uses as fuel to which crude tar, tar oils, naphthalene and pitch can be applied.

J. L. WILEY

Utilization of bagasse fuel. Z. KOGAN. *La. Planter* 70, 230-1(1923).—The value of bagasse as a fuel depends upon the efficiency of removing the excess moisture present. A special drying conveyor and furnace is proposed to give the max. heat value of the bagasse.

C. H. CHRISTMAN

Lead-bath process of low-temperature carbonization. J. S. MORGAN. *Iron Coal Trades Rev.* 106, 530(1923).—The lead bath has been used for the distn. of coal-tar oil, alkali fusion, for synthetic phenol and  $\beta$ -naphthol, and the drying of various materials including coal. It should also be applicable to the low-temp. carbonization of coal. The time factor would be very short compared with other processes, a saleable, smokeless fuel would result, and a high-quality gas of about 750 B. t. u., which would contain no naphthalene, no high-temp. S compds. but a large amt. of  $(NH_4)_2SO_4$ . The yield of petroleum oils would be greater than that of benzene by the high-temp. process. The tars would be very fluid and contain very little pitch. The depreciation of the lead in the bath was almost negligible.

J. L. WILEY

Naphthalene: its occurrence and removal. W. H. FULWEILER. *Am. Gas J.* 118, 354-60; *Gas Age-Record* 51, 205-7(1923).—Naphthalene is generally a high-temp. product, probably due to secondary reaction. It apparently may exist in amts. greater

than the theoretical. Condensation alone is ineffective in removing it entirely from gas; some form of scrubbing is essential. Naphthalene stoppages may be prevented by adding a low-tension oil such as kerosene in the form of a fog. The amt. of naphthalene that may be safely sent into the distribution system depends fundamentally on the amt. of vapors in the gas and the temps. in the system. A careful study of the concn. in the street drips is an effective way of predicting possible trouble.

**The early history of the gas process.** J. L. WILEY. *Engineer* 135, 331-2 (1923); illus. D. B. DILL

**Gas works before and after the war.** J. HIJDELAAR. *Het Gas* 42, 199-202 (1923).—Statistical data show considerable decrease of gas consumption after the war. R. B.

**Ferro-concrete and its applications to gas-works construction.** J. TWIST. *Gas J.* 162, 105-8 (1923). J. L. WILEY

**Continuous production of water gas.** GWOSDZ. *Brennstoff-Chem.* 3, 343-4 (1922); cf. C. A. 15, 3549; 16, 1005.—Suggestions for avoiding intermittent operation in the generation of water gas are critically examd. It is demonstrated that if the heat absorbed in the "run" is to be supplied as sensible heat in the steam, this would require to be superheated to a temp. much exceeding 2000°. The possibilities of internal elec. heating are regarded favorably. J. S. C. I.

**Petit's wet purification system for gas.** D. STAVORINUS. *Het Gas* 42, 183-7 (1923).—The latest development is described.  $H_2S$  and  $HCN$  are absorbed by means of 25%  $KOH$ , which is regenerated by blowing warm air and  $CO_2$  through it;  $CO_2$  is not discharged into the open atm. but circulates in the system. R. BEUTNER

**Sulfur extraction from spent gas-purifying material using tetralin (and low-temperature tar oils).** A. JÄGER. *Brennstoff-Chem.* 3, 356 (1922).—Expts. to find a substitute for tetralin for the extrn. of S from material used for gas purification have shown that hydrocarbons obtained by fractional distn. of low-temp. tar are quite satisfactory solvents. The best results were obtained with fractions boiling between the same limits as tetralin, about 200-10°. J. S. C. I.

**Use of tetralin in sulfur recovery from active charcoal used for gas purification.** F. SCHREIBER. *Brennstoff-Chem.* 3, 355-6 (1922).—Tetralin offers several advantages when used for the recovery of S from active charcoal which has been used for gas purification. Moisture and S are easily sepd. and the tetralin does not have any effect on the activity of the charcoal, so that the extrn. may be carried on in the purifying chamber itself, saving the expense of handling the purifying material. This is treated 3 or 4 times with hot tetralin (100°) and drained, after which it can be immediately used again for the oxidation process. The S crystallizes out from the tetralin on cooling. The sepd. S is steamed to recover tetralin. On account of its comparatively high price, loss of tetralin must be reduced to a minimum. J. S. C. I.

**Seaboard liquid purification process.** H. R. BROKER. *Gas Age-Record* 51, 499-500 (1923).—Shortly after starting operation of the process at Racine, Wis., it was found that certain factors, such as size of coke, depth of packing, rate of circulation, type of sprays and distribution of liquor, were able to affect materially the efficiency of the process. Also the chilling of the gas by the air blown into the actifier caused a pptn. of naphthalene in that app. and it became necessary to place heating coils ahead of the fan to raise the air temp. Furthermore the odor of  $H_2S$  became a nuisance to the town, the actifier air contg. about 1 part in 300. To dil. this to 1 in 10,000 or less was not found practical; so resource was had to burning the actifier air under the boilers. The process does not appear feasible in populated districts unless the latter method of disposal is practiced. During the first 3 months of operation the av. efficiency of  $H_2S$  removal from the gas has been 67.8% with a consumption of 0.07 lbs. of soda ash per M cu. ft. of gas. The efficiency of the process is increasing and it should be possible to get at least 90% removal of  $H_2S$ . J. L. WILEY

**Everhard-Davis vertical retorts.** ANON. *Gas J.* 161, 832-4 (1923); cf. C. A. 16, 335, 1308.—The construction and operation are fully described. The process partakes of the features of both low- and high-temp. carbonization, the temps. from the top to bottom of the zoned retort ranging from 400° to 1400°. The advantages of both external and internal heating are obtained. Gas makes of 85 to 120 therms per ton of 560 and 450 B. t. u. per cu. ft., resp., can be readily attained by applying steam to the charge. An av. yield of 7 to 10 cwt. of coke per ton of coal is attained besides yields of tar,  $NH_3$ , and benzene common to vertical-retort practice. J. L. WILEY

**Venturi gas meter.** J. L. HODGSON. *Gas J.* 161, 752-4 (1923).—An account of its development. J. L. WILEY

Some aspects of gaseous fuel utilization. J. G. CLARK. *Gas J.* 161, 690-2, 754-8 (1923); *Gas World* 78, 306-12.

Sulfur compounds other than hydrogen sulfide in gas as a factor governing the selection of gas coals. J. B. CRAVEN AND W. A. DUNKLEY. *Am. Gas Assoc. Monthly* 5, 251-4 (1923).—The amt. of S compds., other than  $H_2S$ , allowed to remain in gas for public distribution is limited in most localities to 20 to 30 grains per 100 ft.<sup>3</sup>. From data gathered from many plants it appears that the total S content of the purified gas is not now a limiting factor in the choice of coal. It was found that coals which yield up to 600 grains of  $H_2S$  per 100 ft.<sup>3</sup> of gas do not yield much more than one-half of the total S max. allowed. There is no well defined relation between the S content of the coal and either the  $H_2S$  content of the crude gas or the total S content of the purified gas; neither is high  $H_2S$  always accompanied by high fixed S.

Gasification of lignite in a producer. C. ENGELHARD. *Z. angew. Chem.* 36, 98-9 (1923).—The best conditions for gasifying lignite in a producer are: a slowly downward moving fuel column, a uniform blast distribution over the cross section of the producer, and thus a horizontal zone of combustion. A producer patented by the Eisenhüttenwerk Keula of Muskau fulfills these conditions. It has a flat, stationary grate composed of concentric annular grids pierced by a no. of slits at regular intervals which uniformly distribute the blast. Ash and slag are removed by an S-shaped, propeller-like scraper attached to the ash receiver and revolving with it. The grate and the scraper are cooled so efficiently by the entering air and steam that no deterioration has been observed after several months of continuous use. A fuel column of 80-100 cm. is maintained with an ash zone of 5-20 cm. and a combustion zone of 20 cm. The analyses of the gases are as follows:  $CO_2$  6.8-10.5%,  $O_2$  0.15-0.3,  $H_2$  11.2-19.8,  $CH_4$  0.6-2.3,  $CO$  21.4-30.8, calorific value 1114-1558 cal., calorific value of lignite 2070-4720 cal. To avoid the disadvantage of the powdering of dried lignite, it is preferable to use it in the wet condition and dry the gas produced. On large plants the tar and water are sep'd. and part of the tar is put back into the dry gas before combustion. Drying the gas from moist lignite increases the combustion temp., that of a moist gas from Rhenish lignite of calorific value 2090 cal. and 57% moisture was about 900° whereas the theoretical value for the dry gas was above 1600°. The advantages of the process are stated.

The economy and suitability of the various processes for the production of ammonium sulfate in relation to the sulfuric acid situation and present sources of energy. A. LUTHER. *Glückauf* 59, 314-9 (1923).—A crit. survey, based on calcs., of the direct, indirect and half-direct processes for recovering  $NH_3$  in the production of coke shows that the direct process is not under all circumstances likely to prove more economical than the indirect process.

Manufacture of neutral sulfate of ammonia by direct absorption. ANON. *Iron Coal Trades Rev.* 106, 528 (1923).—The process is being exploited by the Power Gas Corp. on a Moud gas plant. The  $NH_3$  is absorbed from the gas in 2 sep. compartments; the raw gas is treated with a practically neutral liquor in the first and stripped of its  $NH_3$  in the second by acid liquor. The absorption efficiency is 99.17%. The sulfate in the evaporators has an av.  $NH_3$  content of 25.28%  $NH_3$  and an acid content of 0.0127%  $H_2SO_4$ . After drying the former rises to 25.57% and the latter sinks to 0.0113%.

Ammonia losses in carbonization. H. D. GREENWOOD. *Gas J.* 161, 750-1 (1923).—The most important factor in  $NH_3$  preservation is its rapid removal from the hot retort. The temp. of max.  $NH_3$  evolution (800°) corresponds with the temp. at which the evolution of H is also at a max. and hence the  $NH_3$  is formed under the most favorable conditions as regards its gaseous atm. Introducing air and flue gases into the retort will increase the % of N and may tend to increase the loss of  $NH_3$  by dissociation. An ideal condition for preserving newly formed  $NH_3$  would be to maintain a certain % of moisture in the gases throughout the distn.; such a condition is to some extent attained in steaming of vertical retorts.  $NH_3$  yields may be considerably influenced by the character of the coal ash, and to a lesser degree by the type of refractory material used. Cf. Mott, C. A. 17, 1318.

A few aids for recovery of benzene. J. D. MORRIS. *Gas World* 78, No. 2020, (Coking Sec.), 11-3 (1923).—Some simple suggestions for plant control are given. For testing the gas for benzene, the best method is the freezing method of Deville. M. describes a slight modification of it (C. A. 13, 901). It is far in advance of any method involving absorption and distn.

Washing crude benzene with sulfuric acid. R. KATTWINKEL. *Brennstoff-Chem*

3, 357-60(1922).—The addn. of boric acid to the  $H_2SO_4$  used for washing crude benzene results in a reduction by about 25% of the resinous matter formed, and an av. increase of about 2% in the yield of benzene. The action of boric acid seems to be due to the formation of a compd. with the phenolic constituents. J. S. C. I.

**Solubility of montan wax, montan resin and extract B in liquid sulfur dioxide.** W. SCHNEIDER. *Ges. Abhandl. Kennntn. Kohle* 5, 44-5(1920).—The resin is sol., the wax completely insol. in  $SO_2$ . From ext. B, which contained about 19% of resinous constituents, about 22% was dissolved. Thus liquid  $SO_2$  furnishes an effective means of sepp. montan resin and montan wax. J. S. C. I.

**Hydrogenation of phenols by sodium formate and carbon monoxide.** F. FISCHER AND H. SCHRADER. *Ges. Abhandl. Kennntn. Kohle* 5, 516-23(1920); cf. C. A. 15, 3193, 3900.—Only the higher phenols can be hydrogenated by Na formate, neither  $C_6H_5OH$  nor the cresols being affected. This gives the advantage that crude products contg. S can be hydrogenated, at least partially, without any special catalyst. An attempt to hydrogenate low-temp. tar phenols with CO was unsuccessful. J. S. C. I.

**Formation of aromatic coal tar.** H. SCHRADER. *Ges. Abhandl. Kennntn. Kohle* 5, 452-69(1920).—From the results of expts. on the behavior of phenols and aromatic, hydroaromatic, and aliphatic hydrocarbons, when heated with H at high temps., conclusions are drawn as to the mechanism of tar formation in carbonization. The petroleum-like hydrocarbons and the phenols present in the low-temp. tar first formed in the distn. of coal, so far as they are not "cracked" with deposition of C, react with the H present in the distn. gases, the petroleum-like hydrocarbons being converted into permanent gases and the phenols being chiefly reduced, with formation of benzene and its homologs, but partly condensed to high-mol. compds. The hydroaromatic rings are partly dehydrogenated with formation of aromatic compds., and partly broken down. The yields of low-temp. tar and of phenols increase with increasing O content of the coal. J. S. C. I.

**Bases from crude coal tar.** W. G. GOLLMEYER. *Brennstoff. Chem.* 4, 1-9(1923).—Tar obtained from anthracite coal contains 0.05-0.10% N bases. The bases are found combined with phenols. The light and middle oils obtained by distn. of the tar are richest in N bases. These distillates are treated with alkali, and the sol. phenolates thus formed are removed by washing. By further treatment with  $H_2SO_4$  the crude bases are sepd., and then obtained in the free state by neutralization with alkali. The bases from tar obtained from anthracite coal contain a high % of pyridine, while brown coal yields a tar which contains only traces of pyridine. The crude bases are dark brown oily substances having a sp. gr. of 1.0, and b. p. ranging from  $180^\circ$  to  $300^\circ$ . The bases are hygroscopic, and the lower-boiling compds. easily sol. in  $H_2O$ . The bases are to a great extent tertiary amines. *Ibid* 4, 19-24.—The bases (b.  $170-80^\circ$ ) form double salts with  $HgCl_2$ , likewise react with picric acid forming picrates. The N content of the bases varies between 14.58% for the fraction distg. at  $135-40^\circ$ , and 8.27% for the fraction distg. at  $290-95^\circ$ . The mol. wt. values range from 93 for the bases boiling at  $135-40^\circ$  to 164 for the bases boiling at  $290-95^\circ$ . There is a change in the character of the bases starting with those boiling at  $235-40^\circ$ . This is shown by an increase in the % of N over those boiling at  $230-35^\circ$ . A break at this point is also noticed in the mol. wt. The bases boiling at  $230-35^\circ$  have a mol. wt. of 146, while those boiling at  $235-40^\circ$  have a mol. wt. of 133. 50% of the bases boiling to  $170^\circ$  are pyridine and picoline, while those boiling between  $240^\circ$  and  $300^\circ$  consist to a great extent of quinoline, isoquinoline, and methylquinoline. C. T. WHITE.

**High-temperature treatment of hydrocarbons and phenols of different origin.** W. ALLNER. *Petroleum Z.* 18, 1337-50, 1369-78(1922).—Expts. on petroleum and coal tars distd. in gas-oven retorts to produce coke suitable of C electrodes show that the best yield of coke is obtained from the petroleum tars at  $1100^\circ$ . The ash content of the coke was 1.5%. The gas evolved greatly enriches coal gas because of the presence of heavy hydrocarbons. The lower-melting pitches gave gases of higher heat value than the higher-melting patches. Distn. of the oils condensed from the evolved gases showed 29% over at  $250^\circ$  and decided decompn. from this point on, the residue being pitch of low value. Distn. with steam showed only 12% over at  $300^\circ$  and 77% over at  $370^\circ$  with no decompn. The products were much better and the residue yielded 58.7% of coke. Filtration of the petroleum through fuller's earth greatly reduced the ash content of the final product. From 2 to 3% of light oil may be scrubbed from the gases from petroleum pitch distn. by means of mineral-oil distillate. Results of cracking mineral oils, pitches and coal tars in coke-oven retorts indicate that high temps. favor formation of aromatics. Water gas is attained at sufficiently high temps. Formation and decompn. of the olefin hydrocarbons is analogous to the oil-gas process. Vertical-

retort tar must be formed at temps. below 700°. Addn. of steam in the vertical retort tends toward formation of water gas and light-oil fractions. There is a close analogy between the decompn. of petroleum, brown-coal and hard-coal products at high temps. The products formed are controlled by the temp. and duration of the heating.

D. F. BROWN

The combination of sulfur with carbon and its importance from the point of view of the sulfur content of coke. J. P. WIBAUT. *Chem. Weekblad* 20, 242-4(1923); cf. *C. A.* 17, 1706.—Continuing his former work (*C. A.* 13, 2586), W. heats 5 g. pure amorphous C—viz., sugar charcoal contg. 0.1-2% ash—and 5 g. S in a closed glass tube for 24 hrs., to various temps. The products obtained are extd. with toluene to remove the excess S. If the temp. of heating has been 600° 15-25% of the S is bound to the C and cannot be extd. by toluene or CS<sub>2</sub> nor be removed by heating to 800° in a vacuum of 0.5-1 mm. The higher the temp. of heating, the more S is bound to C, which, also, proves that this is not simply an adsorption process, nor is it possible that the S could be bound by the ash of the coal.

R. BRUNNER

Production of semi-coke in a revolving retort with simultaneous compression by rolling. F. FISCHER AND W. SCHNEIDER. *Ges. Abhandl. Kennn. Kohle* 5, 51-4 (1920).—By employing a heavy iron roller in the revolving retort, the coke from a gas coal while in the plastic stage of carbonization was rolled into a compact mass which set on the wall of the retort. In contrast, the lignite coals tried showed no sign of caking under similar treatment, and even when these were blended with 3 times their weight of caking coal no compact semi-coke was obtained. The addn. of crude and oxidized lignite tar was also ineffective.

J. S. C. I.

Low-temperature coking in inclined revolving furnaces. A. THAU. *Glückauf; Iron Coal Trades Rev.* 106, 486-7, 525(1923); cf. *C. A.* 17, 1708.—T. describes, with reference to numbered diagrams, the Fellner and Ziegler type of inclined revolving furnace operating at Celsenkirchen and its auxiliary app. The plant is driven by elec. power and the furnaces are heated by producer or other similar gas. The gases leave the cylinder at 350°. The products per ton of coal treated are: semi-coke 77.04%; gas about 4000 cu. ft.; low-temp. tar 6.46%; thick tar 0.78%; benzene 1.58%. The large coke is gasified in producers, the small is mixed with pitch and briquetted. The crude gas has the compn.: CO<sub>2</sub> and H<sub>2</sub>S 9.55, C<sub>2</sub>H<sub>6</sub> hydrocarbons 2.0, C<sub>2</sub>H<sub>4</sub> 6.8, O<sub>2</sub> 0.3, CO 4.32, H<sub>2</sub> 0.0, CH<sub>4</sub> and homologs 60.51, N<sub>2</sub> 17.01%, calorific value 6735 to 7853 cal. The heat loss in the operation is 6.85%. The consumption of elec. power is 13.42 kw. hr. per ton of coal.

J. L. WILEY

Residual waters of cokeries. R. DURAND. *Bull. soc. pharmacol.* 30, 218-9(1923).—Dead fish on the surface of the Marne river indicated that the water of the river contained some poison, probably from the coke ovens. Analysis proved that the water from the condensers in the cokeries, before purification, contained from 0.085 to 0.17 g. of H<sub>2</sub>S and 0.07 to 0.12 g. of HCN per l. Water from the drain, after purification, contained 0.005 to 0.007 g. H<sub>2</sub>S and 0.0021 to 0.004 g. of HCN per l. Water of the river 15 m. below the entrance of the drain from the purification plant contained no measurable amt. of either H<sub>2</sub>S or HCN. If the water is properly purified with Cl no trace of H<sub>2</sub>S or HCN remains.

L. W. RIGGS

Measuring oven gas at Milwaukee. E. C. BRENNER. *Gas Age-Record* 51, 503-4 (1923).—Experiences with a Connersville Rotary Displacement Meter. Comparative results of a 21-day test show a difference between rotary displacement and a Thomas meter of 0.207% of the gas metered, and between it and a Pitot tube 1.02%.

J. L. WILEY

Difficulties in restarting a battery (of coke ovens). J. W. SPENCER. *Gas World* 78, No. 2020 (Coking Sec.), 10-1(1923); *Iron Coal Trades Rev.* 106, 457. J. L. W.

Works instruments and auto-control of calorific value. J. G. STEWART. *Gas J.* 162, 36-8(1923).—A description of the *Sigma B. & u. Recorder* and its applications.

J. L. WILEY

Unusual occupational injury [in smoke pipe uptake] (PRYOR) 13. Economic geology [coal] of the Summerfield and Woodsfield quadrangles, Ohio (CONDIT) 8.

Nonpotable alcoholic liquid (fuel). F. DE MOURA ACCIOLY. *U. S.* 1,453,374, May. 1. See *Brit.* 187,640 (*C. A.* 17, 1130).

Fuel oil. KYOJI ODA. *Japan.* 40,919, Dec. 1, 1921. A dried mixt. of equal amts. of C<sub>2</sub>H<sub>2</sub> and H<sub>2</sub> is passed over a catalyst below 100° repeatedly, by which fuel oil composed mainly of olefinic hydrocarbons is produced. As the catalyst, Fe, Ni, or Co contg. about 10% Hg is used. The prepn. of the catalysts is described.

**Modifying and enriching gas containing carbon monoxide.** H. R. BERRY. U. S. 1,453,655, May 1. Water gas or other gas contg. CO is brought into contact with reacting materials such as steam and carbonaceous material which convert a large amt. of the CO into CO<sub>2</sub> with simultaneous formation of H and the gas is subsequently enriched by further contact with carbonaceous material and removal of CO<sub>2</sub> in part at least.

**Recovering benzene vapor from gas mixtures.** C. L. VORESS and V. C. CANTER. U. S. 1,453,215, Apr. 24. C<sub>6</sub>H<sub>6</sub> vapors which have been absorbed in activated charcoal are displaced by condensed distg. vapors at a temp. higher than that at which the C<sub>6</sub>H<sub>6</sub> was absorbed. The distg. vapors are displaced by lighter hydrocarbon vapors from substantially denuded gas at a temp. generally lower than that at which the C<sub>6</sub>H<sub>6</sub> vapors were distd. from the charcoal and the lighter hydrocarbon vapors are displaced by heavier C<sub>6</sub>H<sub>6</sub> vapors from the gas mixt. being denuded at a temp. lower than that at which the previous displacement of C<sub>6</sub>H<sub>6</sub> by distg. vapors was made. Cf. C. A. 16, 2944.

**Gas retort.** HIKOROKU KAWASHIMA. Japan. 40,726, Nov. 24, 1921. An improvement in a gas retort of the vertical type. The retort is heated at 3 parts, upper, middle and lower. Coal is charged from the top, while coke is discharged from the bottom, where steam is sprayed upon the heated coke, by which water gas is produced and the coke is cooled. The manufd. gas is therefore a mixt. of the usual coal gas and water gas.

**Coke oven.** W. E. ROBERTS. U. S. 1,453,605, May 1.

**Coke oven.** KAN MAKITA AND THE MITSUI KÖZAN KABUSHIKI KAISHA. Japan. 40,815, Nov. 30, 1921. The heating chambers are grouped by 4's or multiples of 4. Gas is burned alternately in the outer and inner 2 chambers. The interior of the chamber can be observed by the horizontal flue.

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**Preparation of petroleum from rosin.** SEIJI KAWAI. *J. Chem. Ind. (Japan)* 25, 1421-5(1922).—Com. rosin was used which had acid no. 162.1, sapon. no 178.3, and m. p. 72-5°. This was mixed with various proportions of the Japanese acid earth, which is a yellow powder, contg. 69.25% SiO<sub>2</sub>, 15.87% MgO, Fe<sub>2</sub>O<sub>3</sub>, and 8.54% loss on heating. The mixt. was gradually heated in a flask under ordinary pressure. Decomp. of rosin starts at about 160°, and ends at 350°, leaving a black residue contg. unsatd. rosin clay and C. The results are as follows:

Rosin in g.	Acid earth in g.	Oil obtained cc.	% of yield for rosin.	Appearance.	$d_{44}^{15}$	Acid value.	Wijs.
50	25	35	63	pale greenish	0.9025	1.18	25.9
50	50	32	57	water white	0.8898	0.9	24.2
50	100	25	44	water white	0.8751	—	—
200	300	96.2	42	water white	0.8739	0.6	19.0

When rosin and acid earth were mixed in 4 : 6 ratio, pale greenish oil was obtained which has  $d_{44}^{15}$  0.8729, acid value 0.4, Wijs. 17.4. The results of fractional distn. of the last oil are given in detail. This oil has 88.63% C and 11.70% H, contg., therefore, larger amts. of C than natural crude oil. 11.4% of the oil was absorbed when treated with 95% H<sub>2</sub>SO<sub>4</sub> and 49.5% with 98% H<sub>2</sub>SO<sub>4</sub>. The residual oil obtained from 98% H<sub>2</sub>SO<sub>4</sub> treatment has a pleasant odor,  $d_{44}^{15}$  0.8233 and contains 86.89% C and 13.48% H. From this and the results of fractional distn., this oil must contain 50% naphthenes, 40% aromatics and 10% unsatd. hydrocarbon (probably terpenes). Analysis of the black residue obtained by this dry distn. shows that it consists of residual rosin and oil (18%), acid earth (74%), and C (8%). The H<sub>2</sub>O ext. of this residue gives an acid reaction, having acid no. 23.4, which on heating gives AcOH odor. AcOH is one of the products of dry distn. of rosin with acid earth. S. T.

**Refining and analyses of special Galician petroleum.** L. ROSNER. *Petroleum Z.* 19, 291-6(1923).—Complete analyses and yields on refining of 3 Galician crude oils are tabulated in numerous tables and methods of refining are described and compared.

D. F. BROWN

**Gravity correction calculator.** R. P. ANDERSON. *Oil & Gas J.* 21, No. 48, 113 (1923).—A circular rotating chart is described by which gravities of petroleum products



can be calcd. at any desired temp. in either A. P. I., B  . degrees or standard sp. gr. provided the gr. at some temp. is known on any one of these 3 scales.

D. F. BROWN

The chemist in the Rumanian petroleum industry. *Petroleum Z.* 19, 299-302 (1923).—A general review of the work accomplished by chemists in the refining industry in Rumania.

D. F. BROWN

Development of the natural gasoline industry in California. R. E. BACKLEY. *Nat. Petr. News* 15, No. 18, 91-4(1923).—A history of the development of this industry in Calif. 99 plants are now making natural gasoline in Calif. of which 68 use the absorption process. The total capacity of these 99 plants is 445,500 gal. daily.

D. F. B.

Charcoal absorption process. C. L. VORESS, V. C. CANTER AND R. W. SKOOG. *Oil & Gas J.* 21, No. 47, 11(1923); *Nat. Petroleum News* 15, No. 18, 97-102(1923); *Refr. & Nat. Gasoline Mfr.* 2, No. 4, 11-2(1923).—A general description of a charcoal absorption plant for making casinghead gasoline.

D. F. BROWN

Process stabilizes natural gasoline. J. A. RAFFERTY. *Nat. Petroleum News* 15, No. 17, 35-43(1923).—An improvement which is claimed to eliminate entirely wild gases in natural gasoline has been successfully used in the absorption process (cf. U. S. pat. 1,429,175, C. A. 16, 3753). The vapors from the distn. of the absorber oil pass through the regular condensers and receivers. The non-condensable gases are then compressed under varying pressures in a series of compressors whereby a fractionation is partly effected. The compressors open into a rectifying tower at different points. The bottom of the rectifying tower connects with a stabilizing kettle equipped with steam coils for heating. It is claimed that in this way an absolutely sharp cut is made between the gasoline and the non-gasoline constituents and the wild gases escape from the top of the tower and become available for fuel. Gasoline made in this way analyzed  $C_4H_{10}$ , 0;  $C_4H_8$ , 0;  $C_4H_{10}$ , 46.2;  $C_4H_{12}$ , etc., 53.8%; sp. gr. of product 93   B  , vapor pressure at 100   F. 13 lbs. per sq. in. It is claimed that the butane content may be controlled between the limits 20-60%. Propane is harmful in natural gas gasoline because of the great loss it causes in weathering and because it prevents the inclusion of butane which is beneficial. Data are presented to support these statements.

D. F. BROWN

Composition of mineral cylinder oils. J. MARCUSSE. *Chem.-Ztg.* 47, 251-3 (1923); cf. C. A. 5, 3728; 4, 247.—The formolite numbers of American cylinder oils range from 18 to 39, as contrasted to values of 92 to 97 for similar oils as reported by Nastuykov. The following values are reported: Vacuum Gargoyle Hecla 25, Vacuum Gargoyle Extra Hecla 28, Vacuum Extra Hecla Mineral 36, Vacuum Gargoyle 600 W 38.6, Vacuum 600 W Mineral 25.2, Vacuum Voco 27.5, and Standard Vaporine H. D. dark 18. M. discusses the work of Nastuykov and Herr. Both American and Russian cylinder oils are composed principally of naphthenes and polynaphthenes, the American oils contg. fair amts. of paraffin and 12-28% of cyclic unsatd. hydrocarbons as calcd. from the formolite numbers. The results of Nastuykov, which indicated these oils to be composed chiefly of cyclic unsatd. hydrocarbons, are shown to be high. A variation in the usual procedure for the detn. of the formolite number, for cylinder oils, is the sepn. of the formolite from the unattacked oil by a Graefe extn. app. with benzene as solvent.

C. B. EDWARDS

Refining of fuel. P. BRUYLANTS. *Bull. soc. chim. Belg.* 32, 194-214(1923).—The cracking process and various theories referring to it, as well as the recent Bergius process, are described. According to the directions of the Bergius process, B. has also prepd. a low-boiling oil from a Panuco asphalt oil by means of  $H_2$  at 300   under 50 atm.

R. BEUTNER

Investigation of benzine and benzene. J. PRITZKER AND ROB. JUNGKUNZ. *Chem. Ztg.* 47, 313-5(1923); cf. C. A. 16, 2403.—Of various methods of testing for  $C_6H_6$  and benzine which were investigated, the method of Schwarz was found satisfactory as a qual. test for  $C_6H_6$  in benzine. The Zeiss butyrefractometer is used for both qual. and approx. quant. detns. of these materials in the presence of each other. Pure  $C_6H_6$  has a scale reading above 106 at 15   and 35  . 5% benzine drops this to 91   at 35  . From this point, the values fall with increasing percentages of benzine, being 0 for 95% benzine and 5%  $C_6H_6$  at 15  , with pure benzene -3 to -5 at 15  . The sulfonation method for the quant. detn. of benzine is reliable when carried out as follows: a special "benzine tester" used is a 40 cc. flask with a long narrow neck holding 7-8 cc. and graduated in 0.1 cc. Twenty cc. of 1.86  $H_2SO_4$  is placed in the flask and 5 cc. of the sample is added in 15 min., with shaking, after which it is allowed to stand 15 min. Conc'd.  $H_2SO_4$  is added to bring the liquid level into the neck, and the flask and contents are centrifuged for 5 min. at 800-1000 r. p. m. The vol. of the unsulfonated residue collected in the neck is multiplied by 20 to give vol. %. With up to 20% ben-

zine in  $C_6H_6$  this method gives accurate results, but above this point the results are low, owing to pure benzene showing 10–15% dissolved by  $H_2SO_4$ . By a suitable combination of the Zeiss butyrefractometer and the sulfonation methods, either 5%  $C_6H_6$  or 5% benzene can be detd. with fair accuracy. The same procedure can be used for benzene and similar hydrocarbons in turpentine. C. B. EDWARDS

**Novia Scotia torbanites.** R. T. ELWORTHY. *Oil Eng. & Finance* 3, 508–10 (1923).—*Cf. Ibid* 3, 37–42.—The behavior of kerogen at temps. of 300–550° was studied under the microscope. The material darkens slightly at 300° and quite noticeably at 400–550°. At 450° violent decrepitation occurs and from 500° to 550° the material assumes a lighter color about equal to that of the ash left in the crucible after ignition. When 1.324 g. were heated under a vacuum of  $1/2$  cm. Hg no gas was evolved below 380°. Twenty cc. were collected between 380° and 440°. At that temp. oil vapors were evolved and condensed. At this point the pressure was about 30 cm. of Hg. Rapid evolution of gas and oil occurred to 500°. Seventy-eight cc. of gas and 1.4 cc. of oil were collected. Further heating to 700° gave no more oil or gas. The residue gave on analysis C 35.3%, H 1.4%, and ash 63.2%. The gas was  $CO_2$  2.80, CO 2.65, O 6.35 (av. of 2 samples), unsatd. hydrocarbon 14.37,  $CH_4$  and  $C_2H_6$  44.10 and H 8.84%. The yield per ton is 254 U. S. Gal. of oil and 1750 cu. ft. of gas. Ultimate analysis of the kerogen showed C 61.27, H 8.58, O (by difference) 11.49, ash 18.74%, ratio C/H 7.14. Solvents had little effect on the shale. Flotation tests were unsatisfactory. D. F. BROWN

**Elk Hills oil field, California.** P. WAGNER. *Nat. Petr. News* 15, No. 18, 23–6 (1923).—The geology and production operations in this field are described. The oil from this field averages about 11–14° Bé. gravity although oil from the deep wells sometimes tests as high as 30–2°. D. F. BROWN

**Oil shale in Esthonia.** D. T. DAY. *Oil Eng. & Finance* 3, 505–7 (1923).—The extent of the shale deposits, products formed and their uses are discussed. Production figures for 1922 are given. D. F. BROWN

**Yield of tar and bitumen from Esthonian oil shale (kukkersite).** W. SCHNEIDER. *Ges. Abhandl. Kennn. Kohle* 5, 69–75 (1920); cf. Kogerman, C. A. 16, 4336, and Cunningham-Craig, C. A. 16, 2777, 3198.—When distd. from an Al retort (Fischer and Schrader, C. A. 14, 3149), this oil shale gave tar 18.5, water 3.7, and residue 71%. In a revolving retort the yield of tar was 16% when distd. with steam and 13.5% without. By extn. with benzene in a Soxhlet app., 0.3% of a viscous oily product was obtained, and by a pressure extn. the yield reached 0.7%. Protracted extn. with HCl and  $H_2$  left a product contg. only 3% of ash and of compn. (ash-free) C 70.8, H 7.8, S 1.8%. The water-free kukkersite contains about 47% of bitumen, which is a brown powder of sp. gr. less than 1. It is scarcely sol. in most org. solvents. J. S. C. I.

**Colombia. The Tropical Oil Company's operations.** G. HOWELL. *Oil Eng. & Finance* 3, 491–6 (1923).—A general description of the oil deposits is given. The oil on analysis shows 37° Bé. gravity, gasoline 30, kerosene 20, asphalt residue 12%. D. F. BROWN

**Paraffin factory practice.** J. W. FLORIAN AND T. NOWOSIELSKI. *Z. deut. Oel-Fett-Ind.* 43, 178–9, 193–4, 209–11, 225–6 (1923).—A description is given of the equipment and operations of a paraffin plant using 600 carloads of Borislav paraffin oil per month by the sweating process. Numerous tables and diagrams illustrate the properties of the raw materials and products. P. ESCHER

**Extraction and its application.** JOS. MÉRZ. *Z. deut. Oel-Fett-Ind.* 43, 98–9 (1923); cf. C. A. 17, 887.—A brief description is given of a *turpentine* recovery-plant, using 10,000 kg. pine stumps as raw material and obtaining in 8 hrs. run 100 kg. water-white turpentine as main product by benzene extn. and 600 kg. rosin and 8,000 kg. wood pulp suitable for cardboard as by-products. An elevation and cross-section of the plant accompany the article. P. ESCHER

**Economic aspects of motor-fuel supply from petroleum (LANE; BAUER) 21. The Albanian petroleum fields (NOWACK) 8. Suggestive evidence of the origin of petroleum and oil shale (JONES) 8. The origin of petroleum (HÖFER-HEIMHALT) 8. Oil and gas resources of the Osage Reservation, Oklahoma (WHITE, et al.) 8. Production of H by the thermal decomposition of oil (WEAVER) 18.**

**Reducing viscosity of hydrocarbon oils.** J. P. PERSCH. U. S. 1,453,479, May 1. Heavy petroleum oil or a similar oil to be treated is placed in a large container and heated air or other gaseous fluid is forced through a nozzle into the oil to atomize the oil at the nozzle. The atomization products are confined within an open-ended pipe and caused

to pass through the pipe to promote contact between the gaseous carrier and the small particles of atomized oil, after which the oil and gas are sepd. from each other and the oil is returned to the main body of oil. This treatment of the oil is continued until the entire mass of oil has been sufficiently acted upon to produce a larger yield of gasoline or the like which may be distd. with the air current.

**Self-sealing tank for gasoline or similar liquids.** C. A. CLEGHORN. U. S. 1,453,305, May 1. The walls of the tank include a layer of sponge rubber with a coating of Turkish birdlime on the face of the rubber.

**Apparatus for treating oil shale or similar materials.** C. P. BOWIE and M. J. GAVIN. U. S. 1,453,037, Apr. 24. A conical retort is constructed with an underlying heating hearth for receiving the oil shale or other material to be treated. The hearth is spaced from the base of the retort to leave a peripheral opening and a rake revolves over the hearth so as to move the material to the opening and plates are arranged to provide a seal for the opening. Vapors evolved are led off through offtakes in the wall of the retort.

**Separators for oil and gas from wells.** R. CONRADER. U. S. 1,452,549, Apr. 24. Oil from a well is led to a separator in which the free gas is taken off and then to a second separator operating under reduced pressure and from which additional gas is taken off. A pump for withdrawing oil from the second separator is controlled in accord with delivery of oil to the separator.

**Treating rock asphalt.** J. B. SMYTH. U. S. 1,452,898, Apr. 24. Comminuted porous rock asphalt, the pores of which are partially filled with hard asphaltic material, is treated with only sufficient asphaltic oil or other solvent of the asphaltic material to soften the surface of the material so that it can be kneaded together to fill the voids of the rock and to render it suitable for paving.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Comparison between ordinary and compressed (corrugated) sulfite wood pulp and the papers produced therefrom.** [Determination of chlorine-consumption value of pulp]. G. K. BERGMAN, E. ALMBERG, AND K. E. EKHOLM. *Papierfabr.* 20, 1493-6, 1529-36, 1561-4 (1922).—Compressed corrugated sulfite pulp is prepd. by the use of special press rolls with heavy loads in order to economize steam in the drying cylinders and increase the output of the machines. Ordinary sulfite pulp comes to the drying cylinders contg. 35-6% of dry fiber, whereas the corrugated pulp can be pressed to 45-55% of dry substance, according to the load on the press rolls. A comparison between the two kinds of pulp run from the same batches showed that when reduced to the same condition they can be bleached in the lab. equally well with the same amt. of Cl, but in the factory the compressed pulp is not easily disintegrated by the ordinary types of bleaching engine, and lumps of unpenetrated material are liable to persist unbleached when the operation is completed. The highest pressures (50 tons on each bearing of the press-roll) are not suitable for the manuf. of pulp which has to be bleached, but moderate pressures of 20-30 tons are permissible. Comparative paper-making trials were conducted both in the lab. and on the large scale, the results of which showed no perceptible difference between the tensile qualities of the papers from the ordinary and the compressed pulps beyond the limits of experimental variations. Undoubtedly the compressed pulp is more difficult to disintegrate in the hollander and may produce hard lumps in the paper; this defect is more liable to occur with the use of flat strainers than when rotary strainers are employed. The authors propose certain modifications in the method for detg. the Cl-consumption value of sulfite pulps. The consumption of Cl increases with increase of the excess of bleaching liquor taken over the equil. value, and with a const. prescription for different types of pulp, the excess over the equil. value is variable. It is therefore proposed to perform the test in duplicate with different excessive quantities of bleach liquor, plot the two results on a system of coordinates showing Cl taken and Cl consumed, and det. the point of intersection of the line passing through the two points thus found with that of a line drawn at an angle of 45° with the coordinates. This point of intersection is taken as the equil. value. J. S. C. I.

**Bleaching of sulfite wood pulp.** C. G. SCHWALBE AND H. WENZL. *Papierfabr.* 20, 1625-31 (1922).—Bleaching trials on a small scale were carried out using a ball mill in place of a hollander; concn. of the stuff was 6.5%. A comparison between cold bleaching and warm bleaching (30-5°) showed a distinct advantage in favor of the latter as regards time, quality, and yield; it is not advisable to work above 40° owing to the for-

mation of brownish specks of clotted resin. The passage of a current of air through the closed app. shortened the time of bleaching by  $\frac{1}{2}$  with warm bleaching, but had no influence in cold bleaching. Contrary to the general opinion, the chlorate Cl plays a useful part in the bleaching operation, and is rapidly consumed; a similar result, however, was not obtained in the bleaching of jute, raw cotton, and mech. wood pulp. Analysis of the bleached pulps showed a great superiority as regards ash content of the pulp drained and washed in the centrifuge as compared with that washed by draining only. In spite of the use of 3 times the quantity of water the pulp washed in the drainer showed 0.45% of ash, as against 0.15% in the centrifuged pulp. Better elimination of org. impurities at the same time may also be inferred, and the structure of the pulp becomes more like that of cotton. The  $\alpha$ -cellulose value is reduced by bleaching above 35°, also by bleaching cold if the operation is prolonged. Warm bleaching and the action of the air increase the Cu value. The best yield is obtained by bleaching at 30–5° with access of air; it is reduced by prolonged cold bleaching. J. S. C. I.

**Determination of sugars in waste sulfite liquor.** M. KLEINSTUCK. *Zellstoff u. Papier* 3, 51 (1923).—The method of Glassmann, employed for detg. hexoses and pentoses, is modified in that the Hg freed by the sugars is allowed to react with I soln. in the cold; the excess I is titrated with  $\text{Na}_2\text{S}_2\text{O}_3$  soln. The procedure is given in detail.

J. L. PARSONS

**Bean straw as raw material for paper.** H. POSTL. *Wochbl. Papierfabr.* 54, 973 (1923).—It is suggested that those substances in bean straw possessing high fertilizer value be extd. by a mech. process and that the remaining cellulosic material be used for producing paper and paper board. Bean straw contains 10.00% moisture, 7.04% ash, 6.19% protein, 39.13% crude fiber, and 35.26% N-free ext. J. L. PARSONS

**Influence of the grinding temperature on the properties of ground wood.** JOHANNES TEICHER. *Papierfabr.* 21, 153–8, 163–8 (1923).—Fresh water was used in all the grinding tests. Expts. were carried out at 18°, 25°, 33°, 40°, 46°, 57°, 60° and 64°. Raising the grinding temp. refines the product until 57° is reached, at which temp. the stock diln. is 1 : 20.8. A microscopical investigation at 57° showed the presence of many individual fibers together with small amts. of mucilaginous substances. The breaking length of hand-made paper made from ground wood produced at 18° was 2359 m.; at 57° it increased to 3856 m.; at 64° there was a decrease to 3002 m. The grinding at different temps. had no effect on the rosin and fat content of the ground wood.

J. L. PARSONS

**Ash utilization.** S. ROSARIO. *Papierfabr.* 21, 126–7 (1923).—The use of ashes from lignite, peat or wood in the pulp and paper industry is suggested. R. has successfully employed ashes for the production of straw pulp in S. America. J. L. PARSONS

**Studies on mechanical paper technology.** F. BOBROV. *Bumazhnaia Promyshlennost* (Russian), 1, No. 1, 7–24 (1922).—It is shown mathematically that the following expression can be derived for the beating of fiber:  $A/m = 2(F_{\text{max}} - F_0)/(T - t)$ , where  $A/m$  = condition of material after time of beating  $t$ ;  $F_0$  = initial surface;  $F_{\text{max}}$  = surface of material after complete reduction (either beating to smallest particles or to max. development of surface) at end of time  $T$ . Equation between  $A/m$  and energy spent in beating is also given. The remainder of the article is purely theoretical.

M. L. CAUST

**Checking and removing the results of disease and destruction of valuable books, manuscripts and drawings.** B. HAAS. *Chem.-Ztg.* 46, 561–2, 1077–80 (1922).—H. discusses the relative resistance of rag, sulfite, sulfate and mech. pulps and the effect of various sizings and fillers upon this resistance. The various destructive agencies are pointed out and the results of treating paper with light, HCN and  $\text{SO}_2$  are compared.  $\text{SO}_2$  treatment is the most reliable, although care must be taken that the dyes are not attacked. The value of thymol, used by the British Museum, is discussed and various arguments are advanced against its use. The possible use of various sulfites, either dry or in soln., is discussed at length. C. J. WEST

Effect of  $\text{HClO}$  solutions and of bleaching liquors on cellulose (KNECHT, EGAN) 25.  
Fireproofing paper, etc. (Japan. pat. 41,008) 13.

**Paraffin paper for mimeograph.** FUJITO YAMANOUCHI. Japan. 41,034, Dec. 9, 1921. Addn. to 40,652. A film of dammar is made on a paper by painting with a  $\text{CS}_2$  soln. of dammar and drying oil, such as castor, tung oils, etc., on which a paraffin film is produced.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Use of petards of black powder in sporting cartridges charged with smokeless powder. NAZZARENO BAGAJOLI AND GIUSEPPE DE FLORENTIIS. *Giorn. chim. ind. applicata* 4, 457-8(1922).—The use of very small petards composed of a few cg. of fine grain black powder (0.05 g. for 12 and 16 caliber, 0.03 g. for 20 caliber) in lively sporting cartridges charged with smokeless powder brings about a decrease of pressure in the rifle barrels which in some cases exceeds 220 kg./sq. cm., with very little or no change in the projectile velocities.

ROBERT S. POSMONTIER

The solubility of tetranitroaniline in organic solvents. C. A. TAYLOR AND WM. H. RINKENBACH. *J. Am. Chem. Soc.* 45, 1218-20(1923).—When purified TNA was slowly heated it began to darken at 200°; at 215-7° it became black and began to liberate gas. This decompn. is strongly exothermic, the temp. rising rapidly to 225° when there was usually violent combustion. Soly. detns. were made at 0° for H<sub>2</sub>O, MeOH, EtOH, Et<sub>2</sub>O, Me<sub>2</sub>CO, CHCl<sub>3</sub>, CCl<sub>4</sub>, CS<sub>2</sub> and C<sub>3</sub>H<sub>8</sub> and at 3.9° for C<sub>6</sub>H<sub>6</sub>. The soly. was most marked in Me<sub>2</sub>CO.

CHARLES E. MUNROE

The explosion and detonation temperature of nitroglycerin. ALFRED STETTBACHER. *Z. angew. Chem.* 36, 60-1(1923).—Commenting on the great differences in the various detns. of the initial explosion temp. of C<sub>3</sub>H<sub>5</sub>(NO<sub>3</sub>)<sub>3</sub> ranging from 180° by Nobel to 220-55° by Staudinger, S. again calls attention to the wide differences that must result from any variations in the wt. of material taken, its exposure, the rate of heating, and particularly its condition of purity. Various methods are criticized and it is held that in these studies careful observations and records should be made of the points of inflammation, scintillation, puffing off, weak or heavy report, and soot sepn. C. E. M.

Hazards in gas compression. A. D. RISTEEN. *Chem. Met. Eng.* 28, 632(1923).—H, O, CO<sub>2</sub>, Cl and NH<sub>3</sub> are considered and the precautions to be taken to avoid danger stated. Contrary to the usual assumption that NH<sub>3</sub> does not form explosive mixts., it is found that a mixt. of air with 16-27% NH<sub>3</sub> can be exploded. C. E. M.

Explosions in liquid air rectification plant. Discussion. *J. Soc. Chem. Ind.* 42, 139-42T(1923).—Discussing Fyleman's paper (*C. A.* 17, 1147, 1551), W. R. ORMANDY pointed out that the reduction of danger of explosion in Diesel engines, by substituting steel for Cu coils for bringing air to the compressor, supported the C<sub>2</sub>H<sub>2</sub> theory. NAPIER-PRENTICE held that if a fuel could be produced that would work at a lower temp. many of the problems of internal-combustion engines would be solved. A. L. SIMON reviewed explosions in air-compressors beginning with one which wrecked a mine in Saxony. He had observed an odor of C<sub>2</sub>H<sub>2</sub> when working compressors underground and found the exhaust valves choked with C. J. A. HARKER stated C<sub>2</sub>H<sub>2</sub> was decomp. into its elements by detonation, initiated by a spark, under a few atms. pressure and H thus obtained was used in large quantities at Friedrichshaven for Zeppelins. This was styled the "Carbonium process." G. W. F. HORNER working on air compressors for torpedo work found C deposit less on valves of the 3-stage than of the 2-stage compressors. P. DVORKOVITS found if oil were heated under pressure there was a crit. temp. between 280° and 320° at which intermol. rearrangement of the hydrocarbons took place and H was set free. A. E. MALPAS stated that at the large Norwegian liquid air plants all risk of explosion was avoided by drawing off every hr. a bucketful of liquid O from the liquid O receiver, where the solid C<sub>2</sub>H<sub>2</sub> was trapped, and throwing it away.

CHARLES E. MUNROE

Explosion of sugar dust, its causes and prevention. P. BEYERSDORFER. *Z. Ver. deut. Zuckerind.* 72, 475-533(1922); *Intern. Sugar J.* 24, 573-7.—In the last 3 decades there have been 62 dust explosions in German sugar refineries. With one exception these explosions occurred as the factories were starting. The literature of sugar-dust explosions is reviewed. B. finds the ignition temp. of sugar dust to be 410° in air and 371° in O. The minimum concn. of dust required to form an explosive mixt. is 17.5 g. and the max. 13.5 kg. per cu. m. The temp. of ignition depends upon the O content of the air, and the heat of cond. of any inert gas present. CO<sub>2</sub> is especially depressing, even more than N, upon the explosion of the dust. Thermal sugar dust explosions occur in two phases, the first being the gasifying of the dust and the second the oxidation of the gases formed. The elec. nature of sugar-dust explosions is shown, and means are given for its prevention, the most practical of which is the use of CO<sub>2</sub> in the crushing machines.

W. L. OWEN

Hydrogen gas and electric boilers. C. E. SARGENT. *Power* 57, Mar. 20(1923).—An explosion of a steam radiator in an apartment house at Carlinville, Iowa, Feb. 14

which caused death to one and injury to another was found to contain a mixt. of H and O in the radiator which was ignited by a static charge. The steam was generated by electrodes carrying a 3-phase elec. current submerged in the boiler and the explosion occurred when the pit cock on the radiator was opened to promote the circulation.

CHARLES E. MUNROE

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Effect of aniline-black dyeing on factory workers.** RAYMOND WILLIAMSON. *J. Ind. Hyg.* 4, 507-17(1923).—Workers in the various operations in which aniline was used were physically examd., blood counts were made and on these data the workers were classified into 2 groups according as the person's blood contained more or less than 5 million red corpuscles per cu. mm. There is little choice between the steam process and the oxidation process so far as effects on the workmen are concerned. The more hrs. worked per week the greater the chance of the production of symptoms of aniline poisoning and of anemia.

L. W. RIGGS

**Natural and artificial coloring materials.** F. JALADE. *Bull. soc. pharmacol.* 30, 143-69(1923).—In addn. to a description of the natural and artificial coloring materials J. reviews the theories of dyeing, the modifications of fiber to facilitate dyeing, the necessity of maintaining the manuf. of artificial dyes in France, and the present status of the dye industry in America, England, France and Germany.

L. W. RIGGS

**Modern equipment for dyeing, bleaching and finishing operations.** E. A. TURNER. *Canadian Colorist and Textile Processor* 3, 48-54(1923); cf. *C. A.* 17, 1718.—Describes the use of Monel metal in app. for the above processes.

CHAS. E. MULLIN

**Details of a method for determining relative fastness of dyestuffs and physical and practical basis of same.** H. S. BUSBY. *Textile Colorist* 45, 151-6(1923); cf. *C. A.* 16, 2782.—Sunlight in all localities will give the same type of fading but the extent will vary with the total energy exhibited by the sun in that locality. Other light sources may not give a similar type of fading, even though the sources are of approx. the same strength. The character of spectral distribution of the fading source det. the character of the result, and where the source is equiv. to daylight, the fading results are comparable in color-character. Fading is not caused by any one region of the spectrum but is the result of a combination of certain regions and certain relative powers in each region. On account of this variation in the type of fading, sunlight would appear to give the most uniform results, but because of its extreme variations, it is almost impossible to set a standard for sunlight. A relation was established between the action of various sources of light upon dyed fabrics and dye solns. but is not given. Curves are given showing the variation in ft.-candles of sunlight throughout a clear day as compared with cloudy days; the variation in percent of each day in which any sunlight was available for one month; the amt. of sunlight available for fading, by months, for a yr.; and the relative ft.-candles available during an average day for 3 different months.

CHARLES E. MULLIN

**Use of titanous chloride in quantitative dye testing.** O. R. FLYNN. *Am. Dyestuff Rep.* 12, 313-6(1923).—Knecht's method (cf. *C. A.* 5, 1098, 1575, 2231) is described, also Waldrich's adaptation of Knecht's method as used at the Waldrich Bleachery. A lengthy discussion follows.

L. W. RIGGS

**Analysis of tannins and tannin mordants.** ISMAR GINSBERG. *Am. Dyestuff Rep.* 12, 307-12(1923).—The different tannins and tannic acids used in dyeing practice are described, also the Lowenthal method and the Schroeder variation of the Lowenthal method for the quant. detn. of tannin.

L. W. RIGGS

**Tannin analyses in the dye laboratory.** A. PELTZER. *Chem.-Zig.* 47, 165-7(1923).—Directions are given for the detn. of the relative tannin value of common tannin agents. The tannin soln. is titrated with standard  $\text{KMnO}_4$  soln. using indigotin soln. (Indigo rein B.A.S.) as an indicator. As the tannin agent contains other oxidizable compds., it is necessary to make a detn. of the total oxidizable material, then in a second sample ppt. the tannin with hide powder. After filtering the oxidizable material in the filtrate is detd. by a  $\text{KMnO}_4$  titration. From these 2 titrations the tannic acid content may be calcd. Certain tannin agents may contain either ellagic acid or catechutannic acid instead of tannic acid. In making analyses of such material a different  $\text{KMnO}_4$  factor must be calcd.

C. T. WHITE

**Water for the dyehouse.** WM. C. DODSON. *Textile Colorist* 45, 156-7(1923).—

Decaying vegetable matter in a reservoir caused sufficient  $\text{CO}_2$  in the purified  $\text{H}_2\text{O}$  to attack the Fe of the piping and cause trouble with spots on fabrics. CHAS. E. MULLIN

**The effect of hypochlorous acid solutions and of bleaching liquors on cellulose.** E. KNECHT AND J. P. EGAN. *J. Soc. Dyers Colourists* 39, 67-78(1923); cf. *C. A.* 16, 3204.—An effort to show the connection between the O taken up by bleached cellulose as compared with that originally available in  $\text{HClO}$  soln. gave very inconsistent results. With  $\text{Ca}(\text{ClO})_2$  soln., with or without an excess of  $\text{CaO}$ , the O taken up by the bleached cellulose is proportional to that available in the soln., but slightly less O is removed from the soln. contg. an excess of  $\text{CaO}$ . The Cu value of cellulose oxidized by  $\text{KMnO}_4$  is about  $1/10$  that of the  $\text{HClO}$  product for equiv. amts. of O. The Cu value of the  $\text{Ca}(\text{ClO})_2$  product is low, as the alkali of the  $\text{Ca}(\text{ClO})_2$  appears slowly to remove the affected portions of the oxidized fiber so that the residue does not reduce Fehling soln. The tensile strength of yarn oxidized by  $\text{Ca}(\text{ClO})_2$  soln. is less than that treated with  $\text{HClO}$ , due to this removal of the oxidized portion. Expts. with *cutch-dyed* sail cloth oxidized with  $\text{KMnO}_4$  in  $\text{H}_2\text{SO}_4$ , appear to show that a selective oxidation and removal of the cutch first takes place, after which the oxidation of the cellulose proceeds. Diamine brown B gives similar but less effective results than cutch.

CHAS. E. MULLIN

**Cold bleaching.** G. KRANZLIN AND G. BÜHM. *Faserforschung* 2, 259-76(1922).—The Habermann process of *bleaching flax* without boiling (*C. A.* 17, 2056) was operated at a practical bleachery. The cold  $\text{NaOH}$  soln. wetted the yarn more evenly than had been predicted and mech. circulation was not found necessary. Lower concns. of alkali and hypochlorite than those which Habermann recommended were effective. In an example, the first bath contained 4.5%  $\text{NaOH}$ , calcd. on the wt. of yarn, and the first chemic, 4.08% active Cl. After treatment analyses showed 14.2% and 87.5% as the consumption of  $\text{NaOH}$  and Cl, resp. The loss of Cl is higher than Habermann reported. The color of the product after completing 4 cycles of the cold-bleaching process was equal to that of similar yarn bleached according to common methods, but the permanence of the white is not as yet proved. The cold-bleached yarn is harsher than the regular product.

E. R. CLARK

**A note on the reactivity of oxidized cellulose towards diazotized aromatic amines.** A. E. EVEREST AND A. J. HALL. *J. Soc. Dyers Colourists* 39, 47-9(1923); cf. *C. A.* 16, 2412.—The coupling of tetrazotized benzidine (A), and other amines with oxidized cellulose (B), was further investigated to det. if true azo compds. are formed; and whether the reaction may be used for the detection of B. The color does not develop in acid soln. and is complete in alk. soln. only under the conditions necessary for coupling diazo with phenolic compds. Pure bleached cellulose is almost unaffected but the B is colored yellow to brown, the depth of shade being proportional to the degree of oxidation and the amine used. Benzidine type diamines are more reactive to B than the monamines, developing deep and fast shades. Expts. show that B is partially sol. in boiling  $\text{NaOH}$  soln. This ext. has a strong reducing action and develops color with A, the thoroughly extd. B having almost lost its power of combining with A. It could not be shown that true azo compds. were formed in the soln. extd., or if the color was due to decompn. of A by sol. reducing substances extd. from B. The "tetrazo" method was shown to be as sensitive as that of Harrison for B and more sensitive for hydrocellulose (C), so that it is not suitable for distinguishing between B and C. It is more sensitive for C than the methylene blue test.

CHAS. E. MULLIN

**Retting with *Bacillus felsineus*.** I. *Bacillus felsineus*, its discovery and use. F. TOBLER. *Faserforschung* 2, 163-70, 235-7(1922).—Cultures of this bacillus were described by Carbone (*C. A.* 12, 767). It is said to be the most active agent in flax retting by bacterial processes. Cultures are sold under the trade name "Felsinosima." From the originals, working cultures may be grown on potato meal. Flax and hemp are retted by their use in 55-75 hr. Slightly elevated temps. (about  $37^\circ$ ) are used. II. **Industrial retting of flax with *Bacillus felsineus*.** DOMENICO CARBONE. *Ibid* 170-6.—Both lab. and com. trials have proved that the retting of flax and hemp may be simplified and the product improved by use of these cultures. III. **The Carbone method of retting in Germany.** F. TOBLER. *Ibid* 177-84.—The advantages of this method are improved conditions of the effluent water, shorter time, lessened odor, and better-colored fiber. The use of warm water is stressed as essential. E. R. CLARK

**Methods for minimizing the odor of retting flax.** FR. TOBLER. Soran Research Institute, *Faserforschung* 2, 9-21(1922).—Foul odors from retting flax may be minimized and the disposal of effluent water simplified by steeping the raw fiber for 4 hrs. in alk. soln., prior to the retting operation. An alternative method is to destroy the anaerobic bacteria which develop the undesired by-products by aeration. The first

method is preferred since some of the desired bacterial action is brought about by anaerobic growths.

**The active agent in dew retting.** GERHARD RUSCHMANN. *Faserforschung* 3, 22-40(1923).—*Rhizopus nigricans* is over-rated as to its activity in dew retting. It was entirely absent in certain instances and has but little effect on hemp retting. *Mucor plumbeus* is confined to flax and is similar in its activity to *Rhizopus*. *Cladosporium herbarum* is more widely distributed and shows greater activity than either of the others. The part played by such organisms in dew retting depends upon the moisture present. It is to be noted that the conditions are unsuited to the development of the anaerobic *B. amylobacter*, which dissolves pectins.

**The estimation of the fiber content of bast-fiber plants.** G. BREDEMANN. *Faserforschung* 2, 239-58(1922).—According to the recommended method, the stems are boiled for  $\frac{1}{4}$  hr. in 1.5% NaOH soln., to soften the woody matter. The latter is removed mechanically, care being exercised to avoid loss of fiber. The fibrous mass is then boiled again with dil. NaOH soln., washed, dried and weighed. The woody matter may be weighed or detd. by difference. As the resulting fibers are purified more than those of commerce, the wts. of flax and hemp so found should be multiplied by 1.25 before computing percentages.

**The distribution of iron in technically important fibers, etc., and its importance for analytical purposes.** OSWALD RICHTER. *Faserforschung* 2, 189-225.—The results of qual. tests for Fe on a variety of fibers are tabulated, and some data, of botanical rather than chem. interest, on the absorption of Fe by plant fibers from soln. are given. An extensive bibliography on the distribution and detection of mineral matter in plant cells is appended.

**Improved method for sectioning textiles.** N. O. HOWARD AND W. H. SNELL. *Textile World* 63, 747-8(1923).—Small squares of the cloth are dried in an air oven for 15 min. at 110-115°, transferred to small individual paper boxes in a 50-50 mixt. of 52 and 58° m. p. paraffin at 110° for 15 min., and then the boxes contg. the cloth sample cooled rapidly on a block of ice. While the paraffin is solidifying the cloth is held in a vertical position by forceps, and when it is solid the paper is trimmed away leaving a rectangular block contg. the sample. The block is frozen to the head of the microtome with an aq. 10% gum arabic soln. contg. 0.5% phenol, by means of CO<sub>2</sub> or (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>O. Sections as thin as 2 microns can be cut and are removed with a camel's hair brush to float upon H<sub>2</sub>O at 21°. The dried sections are permanently fixed on slides by Meyer's albumin fixative with heat or (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and glue, the paraffin is dissolved with xylene and the mounting completed with Canada balsam.

**Notes on commercial solvent extraction applied to cotton and linen fabrics.** M. FORT. *J. Soc. Dyers Colourists* 39, 42-6(1923); cf. *C. A.* 16, 3001.—Besides the advantage of a better beetle finish on solvent-extd. fabrics, the goods are less liable to yellowing and deterioration with age and the kier boil may be made less drastic. While solvent extn. cannot eliminate or materially reduce the cost of the kier boil, it is useful for certain classes of goods, where all waxes, fats and oils must be removed, such as in bleaching colored-effect goods which will not withstand the pressure kier boil. The same is also true of the enzyme treatment for removal of starch. The higher boiling solvents, such as xylene or tetrachlorethane, ext. considerably more crude wax from the fabric than those boiling at a lower temp. but the recovered wax is darker and almost valueless at present.

**Sizing.** W. H. WHEWELL. *J. Soc. Dyers Colourists* 39, 65-7(1923).—A general discussion of the constituents, compn., mixing, application, etc., of sizes, pointing out the unscientific state of the process.

**Stiffening and finishing felt hats.** ALBERT WINTER. *Deut. Farber-Zig.* 59, 271-2(1923).—A general description of the use of glue, starch, gelatin and shellac in the finishing of bats.

Bark of *Securidaca longepedunculata* (as a textile) (FABREUR) 17. Fireproofing cotton, etc. (Japan. pat. 41,008) 13.

**Vat dye derivatives for dyeing and printing.** M. BADER and C. SUNDER. *U. S.* 1,448,251, Mar. 13. Leuco vat dyes are esterified (probably in the phenolic OH group) with a polybasic acid so that one of the acid groups present remains free to form salts and render the product sol. in H<sub>2</sub>O. Dchydroidigo, the leuco deriv. of 5,7,5',7'-tetrabromoidigo or leucothioindigo may be treated with chlorosulfonic acid in the presence of dimethylaniline or diethylaniline and chlorobenzene at 0°, and the reaction mixt. afterward very gradually heated to 60°, rendered alk., subjected to steam distn.



and the distn. residue concd. and treated with NaCl to ppt. the sulfo ester of the dye. The products thus obtained are stable in the air and when applied to fiber for dyeing are afterward subjected on the fiber to a mild oxidation, *e. g.*, by the action of FeCl<sub>3</sub>, acidulated dichromate or chloride of lime, to obtain a fast dyeing well distributed through the fiber.

**Sulfur dye.** R. HERZ and H. BALHORN. U. S. 1,452,805, Apr. 24. A fast cotton dye is formed by sulfurization of the condensation product of chloranil with a *p*-alkyloxy-*o*-aminothiophenol. The product is a reddish brown powder, which dyes cotton in an alk. sulfide bath or vat claret-red shades fast to washing, Cl and light.

**Dyeing hair or furs.** P. ONNERTZ. U. S. 1,453,021, Apr. 24. A 4-amino-1-hydroxy deriv. of the benzene series, *e. g.*, 4-aminophenol or a chloro deriv., and 2,4-diaminoanisole or 2,4-diaminophenetole are used in aq. soln. with H<sub>2</sub>O<sub>2</sub> or other oxidizing agent and NH<sub>4</sub>OH to produce red-brown, violet, blue or black tints on hair or furs. Cf. C. A. 17, 476.

**Wool-like fabrics from silk.** SEIICHI SAKANB. Japan. 41,104, Dec. 13, 1921. Imitation woolen fabrics are manufd. from waste silk and the like by treating them with HCHO and H<sub>2</sub>O contg. Turkey red oil and by steaming.

**Orifice for manufacturing artificial silk.** SEIJIRO NOGUCHI and SHIMPEI HAMADA. Japan. 40,796, Nov. 29, 1921. The orifice is used for the manuf. of artificial silk from cuprammonium soln. of cellulose. It is made of pure paraffin, by which the luster of the material is increased.

**Textile printing.** KATARO HIRAI. Japan. 40,980, Dec. 6, 1921. Lines or wavy figures are printed on a cloth by a smooth roll. Printing paste is painted on the roll, on which figures are produced by contacting with an uneven comb and then it is used for printing.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**Brightness, whiteness, and hiding power of opaque white pigments, paints and enamels.** H. A. GARDNER and P. C. HOLDT. *Paint Manufs. Assoc. of U. S., Circ. No. 173*, 153-82(1923).—The relations between brightness, opacity, and approach to pure whiteness of pigments and paints are studied by means of measurements with the Pfund colorimeter (C. A. 14, 1251) and cryptometer (C. A. 14, 637). The methods of calibrating the instruments are given in detail, and results on the common white pigments in glycerol and in linseed oil pastes, and in ready mixed paints and enamels are tabulated and plotted. The addn. of ultramarine blue to paints contg. very bright pigments which are low in blue-brightness decreases their brightness somewhat, but makes them far more nearly non-selective, and increases their hiding power tremendously. The tinting color was added only until the limit had been reached without apparent change from white. The high initial blue brightness of lithopone, due to blueing during the process of manufacture, prevents the further addn. of enough ultramarine blue, to have much effect on its hiding power. Instrument readings by different operators show good agreement.

**Report on fire-retardant paints for shingle roofs.** H. A. GARDNER. *Paint Manufs. Assoc. of U. S., Circ. No. 175*, 186-206(1923).—After exposure for 5 yrs., shingles painted with Pamak fire-retardant paint (C. A. 14, 3802) are in far better condition than unpainted shingles, and lab. fire tests show that the painted shingles still retain excellent fire-resisting properties. Details of tests are given. Illus.

**Shellac.** P. H. WALKER and L. L. STRELE. *Bur. Standards, Tech. Papers 17*, No. 232, 277-96(1923).—The source, prepn., uses, properties, and present methods of testing shellac are reviewed. The A. S. T. M. method (C. A. 15, 3884) for detn. of rosin in orange shellac by calcn. based on the Wijs I no. is open to objection and is not applicable to shellac varnishes. A modification of the McIlhenny method (C. A. 2, 1896) which gave excellent results is: Dissolve by heating 2 g. of dry shellac, or its equiv. amt. of shellac varnish, in 20 cc. AcOH (m. 13° to 14°), cool to 19° to 21°; add 150 cc. petroleum ether (b. 55-75°), slowly at first, with const. shaking. Then add H<sub>2</sub>O, shake, and after sepn., transfer 100 cc. of the ether layer to a 100 cc. graduated flask and evap. to dryness, cool and weigh. Det. the acid no. of the residue, and test the residue from another portion of the ether layer for rosin by the Halphen-Hicks method (C. A. 5, 2437). Results obtained on a large no. of dry shellacs and shellac varnishes are tabulated, and a method for rating their quality is suggested. A detn. of the material insol. in hot alc. is conveniently made by heating 2 g. of the shellac in 25 cc.

of 95% specially denatured alc., and then washing through a Gooch crucible with boiling alc. To det. non-volatile matter in shellac varnish, weigh 1.5 g. by difference from a small stoppered bottle on to a tared flat-bottomed metal dish 8 cm. in diam. Heat 3 hrs. at 100–105° and weigh the non-volatile matter. A suggested specification for pure orange shellac is: must be in flake form; petr.-ether-sol., not more than 7%; acid no. of sol. residue, between 80 and 90; Halphen-Hicks test for rosin on this residue, negative; material insol. in hot 95% denatured alc., not more than 1.75%. Shellac varnish shall contain not less than 40% non-volatile matter; volatile matter shall be 95% specially denatured alc. (U. S. Int. Revenue Bur. Formula No. 1). The film of shellac on clean, bright tin after drying overnight must be as hard as, and resist the action of turpentine as well as, a varnish made from pure orange flake shellac. The same requirements as for the pure dry shellac apply to the shellac varnish when calcd. to the basis of the non-volatile matter in the varnish. F. A. WERTZ

**Improving drying properties of glycerides.** H. A. GARDNER. U. S. 1,452,553, Apr. 24. Glycerides such as soy bean oil are chlorinated and then at least partially dechlorinated to improve their drying properties and render the product suitable for use in paints.

**White lead.** E. A. SPERRY. U. S. 1,452,620, Apr. 24. A highly pulverulent white lead is deposited electrolytically, washed, dried and ground until the oil-absorbing capacity is substantially reduced and finally ground in oil in substantially the same manner as nonelectrolytic white lead is ground.

**Paint.** GENZO SHIMAZU. Japan. 40,704, Nov. 18, 1921. The paint is a mixt. of powd. Pb, boiled oil, varnish, casein soln., cellulose ester, etc. The Pb used here is an amorphous extremely fine powder, which is easily oxidized in the air to litharge. When painted on a material, the material becomes covered homogeneously with a PbO layer.

**Paint.** KOTARO TANAKA and TOMOKAZU TAKAHASHI. Japan. 40,771, Nov. 28, 1921. 125 g. of powd. copal and 32 g. of powd. amber are mixed with a mixt. of 337 g. of Et<sub>2</sub>O and 175 g. of acetone, warmed at 30° and shaken and then the soln. is mixed with 165 g. of alc. and 92 g. of turpentine oil and shaken again. After standing, the clear upper layer is used as a paint. It forms a lustrous, transparent and hard film.

**Paint.** TAIZAN SHIGA. Japan. 40,783, Nov. 29, 1921. Addn. to 40,388 (C. A. 17, 1895). The paint is for ship's bottoms, etc. 1000 parts of a mixt. of 800 of linseed oil, 200 of tung oil and 100 of litharge are mixed with 1000 resin, 500 Cu resinate, 400 of turpentine oil, C<sub>6</sub>H<sub>6</sub>, naphtha or their mixt., 1000 Cu<sub>2</sub>O, 250 red ppt., 1000 of Cu arsenite and 800 of pigment (commonly Fe<sub>2</sub>O<sub>3</sub>) and thoroughly mixed.

**Paint for rubber.** KINJIRO WATABE. Japan. 41,141, Dec. 19, 1921. The paint is manufd. by dissolving a mixt. of 2 lb. of linseed oil, 1 lb. of tung oil, 2% (of the total mixt.) powd. Ce and 0.5% Mn borate into oil of turpentine, toluene, xylene, etc. It forms a lustrous, water- and acid-proofing film.

**White paint for shoes.** SHIN-ICHI YOKOYAMA. Japan. 40,804, Nov. 29, 1921. The paint is a mixt. of 8 parts of Na<sub>2</sub>O<sub>2</sub>, 100 of H<sub>2</sub>O, 10 of BaCl<sub>2</sub>, 20 of ZnSO<sub>4</sub>, 5 of gum, 5 of dextrin, 10 of Al(OH)<sub>3</sub>, 2 of borax, and 10 of ZnO.

**Ink for mimeograph.** FUJITO YAMANOCHI. Japan. 41,033, Dec. 9, 1921. Addn. to 40,608 (C. A. 17, 1896). One part of Ca soap, prepd. from animal or vegetable oil, is dissolved into 3–8 parts of animal or vegetable oil, *e. g.*, castor oil. When the soln. becomes clear, it is mixed with 1 part of lamp black or other pigment in 3 parts of resin oil, and 1 part of animal protein, such as casein, in 5 parts of NH<sub>4</sub>OH.

**Colored ink for mimeograph.** FUJITO YAMANOCHI. Japan. 41,035, Dec. 9, 1921. Addn. to 40,608 (C. A. 17, 1896). One hundred parts of Ca soap are dissolved in 400 parts of an oil, such as castor oil, under heating. This soln. is then mixed with 50 parts of animal or vegetable protein in 200 parts of NH<sub>4</sub>OH and 10 parts of a dye-stuff sol. in NH<sub>4</sub>OH.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The hydrogenation of oils. R. BACHRACH. *China J. Science & Arts* 1, 188-93 (1923).—B. reviews the tech. details for the operation of an oil-hardening plant, and points out the opportunity for the manuf. of margarine in China for export.

Industrial uses of hydrogenated oils. W. W. MYDDLETON. *Chem. Age* (London) 8, 448-50 (1923). Wm. H. ADOLPH  
E. H.

Hydrogenation and dehydrogenation of castor oil and its derivatives. ANDRE BROCHET. *Compt. rend.* 176, 513-5 (1923).—Castor oil hydrogenated at 150° at 11 atm. showed a no. of oscillations in pressure during the process, and when the liquid was cooled H was given off in abundance. The I no. at the finish was the same as for the original oil. Complete satn. was obtained by hydrogenating at 114° for 90 min. At 150° H begins to come off and continues up to 330°; about 1/2 comes off between 270° and 280°. The final product does not correspond to the original oil; it is solid but soft and has an I no. of 20. Castor oil absorbs about 70 cc. H per g. and gives off about 40 cc. per g.

Present status of the bromine number determination of oils and fats. WILHELM VAUBEL. *Z. angew. Chem.* 35, 679 (1922).—From 1 to 2 g. of the sample are dissolved in 50 cc. CCl<sub>4</sub> in a stoppered 1 l. flask and from 200 to 300 cc. of 5% H<sub>2</sub>SO<sub>4</sub> added. Br soln. made as follows is then added to excess: 220 g. Br and 130 g. NaOH in 4 l. H<sub>2</sub>O. After shaking at intervals for 1/4-1/2 hr. the excess Br is titrated with standard NaHSO<sub>3</sub> soln. until the Br color is nearly gone, when a crystal of KI is added and the titration continued, with starch indicator. The results are accurate for practical purposes.

Relationship between the iodine values and refractive indices of some hardened vegetable oils. J. J. SUDBOROUGH, H. E. WATSON, AND D. Y. ATHAWALE. *J. Ind. Inst. Sci.* 5, v, 47-69 (1922).—Samples of cottonseed, linseed, peanut, mohua (*Bassia latifolia*), sesamé, sardine, castor, hongay (*Pongamia glabra*), and coconut oils were refined and hydrogenated at 180°, with Ni catalysts, and the relationship between I value and  $n$  was detd. Except in the case of castor and hongay oils, the relationship between the two const. is independent of the time and of the type of catalyst used. In the case of the first six oils mentioned, the curves representing the relationship between I value and  $n$  lie very close together and may be represented by the equation  $n_D^{60} = 1.4468 + 1.03 \times 10^{-4} + (I.V.) + 7.3 \times 10^{-6}(I.V.)^2$  to an accuracy of about 0.0005. The  $n$ s. at 60° of the above six oils, when completely hardened, are practically identical at the value 1.4468. The  $n$ s. of hardened coconut oil are much lower than those of other oils with the same I value. In the case of castor oil, the relationship between the I value and the  $n$  is not independent of the type of catalyst or of the time of hardening owing to the varying extent to which the hydroxyl groups are reduced. It is possible that the case of hongay oil is similar, although its Ac value is only 24.

The behavior of wood oil under heat and light. J. MARCUSSEON. *Z. deut. Oel-Fell-Ind.* 43, 162-3 (1923).—Action of heat: From soly. tests of the heated wood oil in acetone and from analytical data M. concludes that the coagulated wood oil contains 3 constituents, besides oxidation products and anhydrides: (1) unchanged oil, (2) an oily polymerization product, (3) a solid polymerization product; their amts. vary according to the conditions of heating. Nos. 2 and 3 are chemically identical, the former being the sol- and the latter the gel-form. When rosin, naphthene acid or linseed oil is added to wood oil to avoid its coagulation during heating, polymerization is not prevented thereby, only the gel formation is hindered; the liquefaction of coagulated wood oil on renewed heating indicates that the gel and sol reactions are reversible. Action of light: The solid product resulting from the action of light on wood oil differs from that obtained by heat. Light isomerizes the  $\alpha$ -eleostearin (cis-form) to  $\beta$ -eleostearin (trans-form) and this latter is the light-product proper; but in addn. there is formed a small amt. of a polymerization product of  $\beta$ -eleostearin which is infusible and insol. in fat solvents; larger amts. of it are formed in strong sunlight and at temps. above 32°. The acids obtainable from this solid  $\beta$ -eleostearin by sapon. and acidifying are of soft resin consistency, with an I no. of about 1/4 of that of eleostearic acid but double its mol. wt. and of a sp. gr. above 1.0.

Action of silent electric discharge on fatty oils. L. HOCK. *Z. Elektrochem.* 29, 111-9 (1923).—By detg. certain phys. and chem. properties, it is shown that the electrified oil differs from the starting product (fish oil). The changes brought about in the

P. ESCHER

properties indicate that the ions and electrons on the surface of the oil in the discharge chamber most probably split the double bonds of the unsatd. fatty acids, thereby permitting the formation of polymerized mols. which dissolve in the colloidal state. The actual cause of the marked increase in the viscosity of the electrified oil over that of the raw fish oil, is the existence of the polymerized oil mols. in the colloidal state. Diagrams are given of the app. used for electrifying the oil. H. JERMAIN CREIGHTON

#### Marine soaps and parasiticides (BRUNET) 14.

**Cymenestearosulfonic acid.** L. J. LEWIS. U. S. 1,452,881, Apr. 24. Cymenestearosulfonic acid, adapted for use as a *fat-splitting reagent*, is prepd. by heating cymene 10, oleic acid 19 and 66° Bé.  $H_2SO_4$  60 parts at 100° for 3–5 hrs.

**Extraction of fats and oils.** MORIKICHI HISAYA AND THE GÔMEI KAISHA SUZUKI SHÔTEN. Japan. 40,866, Nov. 30, 1921. An improvement in the extn. of fats and oils from soy beans, etc. The ext., obtained by treating soy beans, etc., with benzine, is heated with NaOH soln. (20° Bé.) in quantity corresponding to the free acid in the oil in a closed vessel, equipped with condensing and agitating devices. When cooled the soap produces a ppt. on the bottom which includes proteins and other impurities. After sepn. from the soap, the solvent is recovered. The oil thus produced is pure and the loss of oil in the process is extremely small.

**Deodorized pupa oil.** KINTARO MITSUI AND TOMOKAZU TAKAHASHI. Japan. 40,860, Nov. 30, 1921. Pupae are boiled in a soln. of boric acid (1.5 lb. in 180 l.  $H_2O$ ) for a few hrs. and then pressed as usual. The oil thus produced has no disagreeable odor.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

**A discussion of Hawaiian raw sugars and their manufacture.** H. C. WELLS. *Louisiana Planter* 70, 188–9, 208–9, 228–9 (1923).—For the production of granulated sugar raw sugar is best when the polarization lies between 97° and 97.5°. A low ash content is desired and should be based on total non-sugars rather than raw sugar. The deterioration factor should not exceed 0.33. Hawaiian raws have run about 0.20. Sulfates should be lower but a decrease in ash would give a lower  $SO_3$  content. Hawaiian sugars filter poorly, 20 lbs. kieselguhr per ton being used where Cuban raws require 4 lbs. The selection of cane varieties in Hawaii has given increased yields of sugar, but the saline content of the cane juice has been increasing. This is due in part to the salt content of the water used for irrigation and to the use of large quantities of fertilizers. This should be remedied through the development of other varieties of cane having a lower saline content. Non-sugars are retained in the mfg. process too long, giving material decompn. and losses affecting both quality and quantity. Irregular liming has caused decompn. of the reducing sugars, lowering quality. The extreme milling of cane in Hawaii, while giving the highest extraction of sucrose, has introduced much fiber into the process and this slows up filtration. Screening before liming or the use of filter cel after liming should remove this trouble. Gummy fermentation should be prevented through the use of hypochlorite. C. H. CHRISTMAN

**Comparative yields of white and raw sugars.** I. H. MORSE. *Louisiana Planter* 70, 168–9 (1923).—A statement is given of the yields probable under 6 systems of factory operation, in order to enable sugar producers to calculate which system is most profitable under existant conditions. C. H. CHRISTMAN

**Protective inoculation of raw sugar.** W. L. OWEN. *Sugar* 25, 117–9, 177–9 (1923); cf. C. A. 17, 1164.—Inoculation of sirups with *A. niger* caused rapid destruction of the sucrose and the formation of excessive amts. of reducing sugars. By passing  $CO_2$  through sirup in flasks, keeping an inert atm. present, the action of *A. niger* was decreased to a min. Torulae when present caused a decrease in reducing sugars, giving a higher figure for sucrose by direct polarization than was obtained by the Clerget test. Incubation of sirups inoculated with molds, but protected by  $CO_2$ , gave no increase in reducing sugars. Since  $CO_2$  is produced by torulae, the presence of  $CO_2$  from any source is shown to be effective in protecting the sugar from inversion. Carbonating a magma did not afford the desired protection. Carbonated sugars showed decided deterioration in the surface film while the torulae-inoculated sugars were only slightly deteriorated. Since sirup as a crystal film is not protected by the  $CO_2$  and sirup in thick layers is

protected through the retention of the gas, this retention is the differentiating factor. The loss in weight due to the sugars utilized is more than compensated by the increase in polarization obtained. C. H. CHRISTMAN

**Chemical losses in white sugar houses.** I. H. MORSE. *Louisiana Planter* 70, 209-11 (1923).—In the process of making white sugar, clarification removes nonsugars and glucose. Inversion of sucrose gives an increase in glucose and increases the difficulty of detg. accurately the loss by inversion. Typical analyses of sugar house products are given and a formula is derived for the calcn. of total inversion. Thus, inversion equals sucrose in juice — (purity of sirup  $\times$  solids represented by juice Brix less 0.2 nonsugars)  $\div$  sucrose in juice. The greatest losses in sugar manuf. come from inversion because of over-acidities and the decompn. of reducing sugars by improper clarification. These, if overcome, should improve both quality and profit. C. H. CHRISTMAN

**The composition of carboraffin.** V. SKOLA. *Z. Zuckerind. czechoslovak. Rep.* 47, 257-8 (1923).—Previous samples of carboraffin showed considerable amts. of ZnO. Samples of unused material furnished for the campaign of 1922 showed about 0.02% ZnO on material as received. So little of this ZnO goes into the sugar soln. that the amt. of ZnO in finished sugar could not be as high as 0.00005%. W. L. BADGER

**The adsorption of sugar by carboraffin.** V. SKOLA. *Z. Zuckerind. czechoslovak. Rep.* 47, 199-202 (1923).—Sugar solns. of different concns. were stirred with weighed amts. of carboraffin. Within the first few minutes there was a rapid drop in concn. of the soln. which finally reached an equil. This decrease in concn. was greater with larger amts. of carboraffin and greater in more concd. solns. Solns. of 50 Brix lost some 0.35-5.3% sugar as the amt. of carboraffin increased from 1 to 20%. In more dil. solns. the loss was of a similar magnitude. The loss was approx. proportional to the amt. of carboraffin added. W. L. BADGER

**Experiments with carboraffin in the Oroska sugar factory.** JANKO PROCHAZKA. *Z. Zuckerind. czechoslovak. Rep.* 47, 202-5; *Listy Cukrovar.* 40, 554 (1923).—The expt. was carried out in 5 Danek filters with 45 inserts of which 22 were removed. Eighty kg. of carboraffin was mixed with water, neutralized to an alk. of 0.005, 2.5 kg. sawdust added and the mixt. sent directly to the filters. First liquor followed immediately and showed a reduction in color from 3.5° to 0 in the first 4 hrs., gradually rising to 0.9° after 24 hrs. This was followed by various remelt sirups of increasing color. In the last one, after 53 hrs. of use on varying products, the color was reduced from 12.3 to 7.0°. The operation was satisfactory in every respect and seems to indicate the probability of completely replacing boneblack with carboraffin. W. L. BADGER

**Testing sugar beet varieties in Moravia in 1922.** FR. CHEMLAR, JAR. SIMO AND FR. MIKOLASEK. *Z. Zuckerind. czechoslovak. Rep.* 47, 273-80, 281-7; *Listy Cukrovar.* 41, 157, 205 (1923). W. L. BADGER

**Modern methods of extracting beet juice.** V. SAZAVSKY. *Z. Zuckerind. czechoslovak. Rep.* 47, 249-55 (1923).—*Lindener's process* calls for the addn. of a dil. suspension of  $\text{Al}(\text{OH})_3$  to thin juice. A very considerable removal of both color and nonsugars is claimed. S. tried this on a factory scale in two different factories but obtained no useful results. There was no appreciable change in purity nor was there any improvement in boiling or in purity of sirups. *Rapid continuous diffusion* as developed by Raabe was also tried on a factory scale. Owing to mech. difficulties representatives of the maker could not keep the app. in operation for more than 10 hours. There was so much fine pulp in the juice that pulp catchers were clogged; the press cakes were full of pulp; and the spent chips could not be held below 0.8% and sometimes ran as high as 4.0%. The draft was 130-150%. The test had to be concluded because the app. could not be kept in operation. W. L. BADGER

**Some methods of sugar analysis.** RAMJI NARAIN. *J. Proc. Asiatic Soc. Bengal, Proc.* 8th Indian Sci. Cong. 17, cxxx-cxxxi (1921).—N. proposes some modifications in the methods for the estn. of sucrose and reducing sugars. (A) The  $\text{Cu}_2\text{O}$  obtained by the reducing action of sugars on Fehling soln. can be very conveniently and accurately converted into  $\text{CuO}$  by heating the Gooch crucible contg. it in the muffle furnace for 45 minutes. The asbestos used in the crucible should be specially prepd. according to the directions given. (B) Sucrose can be estd. in its mixt. by inverting it with 10% citric acid and heating over the water bath for 12 to 15 minutes after it has attained the temp. of the bath. The methods so far recommended (using acids for inversion) result in the partial destruction of either fructose or both glucose and fructose. The modification proposed is free from these defects. (C) Clerget factor for the inversion of cane sugar has been redetd. for the mercury arc lamp light for concns. up to 15%. The value obtained varies from 142.55 to 143.0. E. J. C.

Utilization of bagasse fuel (KOGAN) 21. History of galactose (HARDING) 10. History of xylose (HARDING) 10. Apparatus for the  $\alpha$ -naphthol test for sucrose (SPENCER) 1. Determination of sucrose in the presence of other sugars (JOLLES) 7. Chemical changes in yellow-striped sugar cane (ANON) 11D. Explosion of sugar dust (BEYERS-DORFER) 24. Filter for sugar solutions, etc. (U. S. pat. 1,453,310) 1.

**Purifying raw cane juice.** C. J. G. SORENSSEN. U. S. 1,448,421, Mar. 13. Cane juice (still contg. most of the bagacillio originally left in it in the extrn.) is treated with sufficient milk of lime to neutralize the acid substances present, heated to 105–110° under sufficient pressure to prevent ebullition in a heater through which the material is constantly flowing and then, without interrupting the flow of the juice, it is passed through a filter-press or other device to filter out the bagacillio while still under a pressure of at least 15 lbs. per sq. in. A sterilized, well clarified juice is thus produced from which dense hard sugar crystals are readily obtained.

**Decolorizing saccharine liquids.** J. J. HOOD, J. CLARK and P. G. CLARK. U. S. 1,452,739, Apr. 24.  $Al(OH)_3$  is ignited and cooled and then employed as a filtration medium for purifying and decolorizing sugar solns.

**Supplying apparatus for bone charcoal.** NAGAYASU ASAI and THE DAINIRON SEITÔ KABUSHIKI KAISHA. Japan. 41,031, Dec. 9, 1921. An inclined tube is inserted into a filtering tank in the sugar factory from the top for the supply of bone charcoal. By rotating the tube with a suitable mechanism, the supply of bone charcoal into the tank is so regulated that a homogeneous mixt. results.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Emeritus Professor Henry Richardson Procter, D.Sc., May 6, 1848.** ALFRED SEYMOUR-JONES. *J. Am. Leather Chem. Assoc.* 18, 179–83(1923).—A memorial on the occasion of the 75th birthday of the "father of leather chemistry." J. A. WILSON

**Professor Henry Richardson Procter, F.I.C., D.Sc., F.R.S. An appreciation on the occasion of his 75th birthday.** R. W. GRIFFITH. *J. Am. Leather Chem. Assoc.* 18, 183–5(1923).—A memorial. J. A. WILSON

**Some modern problems in leather chemistry.** ED. STIASNY. *Science* 57, 483–7 (1923).—A discussion of the chem. nature of collagen, the mechanism of bating, and the astringency of tannins. Digestion of collagen by trypsin is greatly facilitated by previous swelling of the collagen in normal solns. of KCNS or KI and the decompn. proceeds only to the peptone stage. It is assumed that the peptone structures are held together within the protein mol. by relatively weak forces and that swelling may be regarded as a preliminary stage in decompn. to the peptone stage. The danger of loss of hide substance in bating is increased by the presence of swelling agents. It is suggested that astringency of tan liquors may be a function of size of tannin particles. Reduction of the astringency of quebracho liquors by the addn. of gallic acid may be due to a resulting decrease in the size of the tannin particles. J. A. WILSON

**The acidity of vegetable-tanned leather.** S. KOHN and E. CREDE. *J. Am. Leather Chem. Assoc.* 18, 189–94(1923).—Dtn. of total acid or hydrolyzable sulfate alone is not a reliable measure of the amt. of acid in leather that may cause deterioration. A better method is to det. the  $p_H$  value of water in equil. with a given proportion of the finely divided leather and then to note the changes in  $p_H$  value caused by consecutive addns. of small amts. of standard alkali until a definite point of neutralization is reached. Thus the amt. as well as the strength of the acid can be detd. and it is probably the strength that is responsible for its deleterious effect upon the leather. J. A. WILSON

**A practical method of color measurement for tanning materials.** T. BLACKADDER. *J. Am. Leather Chem. Assoc.* 18, 194–201(1923); cf. *C. A.* 15, 2747; 16, 658, 2041.—The amt. of light passed by the tan liquor is measured, using light of only one color at a time from the red, yellow, green, and blue regions of the spectrum, making four measurements in all. Practical applications are given illustrating the detn. of both depth and purity of color. J. A. WILSON

**Remarks on the ultra-violet absorption spectrum of tanning extracts.** DE LA BRÛRE. *J. Am. Leather Chem. Assoc.* 18, 150–4(1923).—See *C. A.* 17, 1734. J. A. WILSON

**Chrome tanning. XIV. Some notes on the reaction between chromium sulfate and sulfuric acid.** D. BURTON, R. P. WOOD and A. GLOVER. *J. Soc. Leather Trades'*

*Chem.* 7, 116-21(1923); cf. *C. A.* 17, 1734.—When chrome leather is digested with concd.  $\text{H}_2\text{SO}_4$  and  $\text{Na}_2\text{SO}_4$  as in the detn. of N, the Cr is transformed to a refractory substance intermediate in compn. between  $\text{Cr}_2(\text{SO}_4)_3$  and  $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{H}_2\text{SO}_4$ . Similar substances were prep'd. from Cr salts by treatment with hot, concd.  $\text{H}_2\text{SO}_4$ .

H. B. MERRILL

**Preparation of oak-bark tannin.** RICHARD SCHÖN. *Separate, Giessen* 1920, 33 pp.; *Botan. Abstracts* 11, 683.—A method of prep'g. oak-bark tannin in a very pure form is given. This product is free from N and Mg. It gives a very slightly sol. K salt with an alc. soln. of KOAc. It is very probable that the halogen compds. originate by substitution. This unstable oak tannin was brought to a stable form through the Me deriv. The tannin is optically active. The rotatory power of its Me deriv. in equal parts of acetone and alc. is  $[\alpha]_D^{15} = -43.3^\circ$ .

H. G.

**Progress in the chemistry of glue.** R. KISSLING. *Chem. Umschau* 30, 65-7, 85-7(1923).—A review of the journal and patent literature of the past 2 years, giving references and patent numbers.

P. ESCHER

**Quantitative determination of adhesive colloids in glue.** FRANZ LORENZ. *Papierfabr.* 21, 105-10(1923).—Full directions are given for the following tests on glue: moisture, ash, acid content, foreign substances, and adhesive colloids. The last test is carried out according to the Wislicenus adsorption method. The app. is sketched and a detailed description is given of the procedure. References are made to the following tests: viscosity, m. p. of the jelly, degree of swelling, soly., tensile strength and binding power.

J. L. PARSONS

**Tannin analyses in the dye laboratory (PELTZER) 25.** Analysis of tannins and tannin mordants (GNSBERG) 25.

**Leather covered with rubber.** KIVOUYUKI SENGOKU. *Japan.* 41,025, Dec. 9, 1921. One surface of leather is coated with a material, such as blood, cellulose, or glue, which prevents the penetration of gas and liquid and does not penetrate into leather. The other surface is moistened with a rubber solvent, such as  $\text{CS}_2$ ,  $\text{Me}_2\text{CO}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$ , benzine,  $\text{CHCl}_3$ ,  $\text{CCl}_4$ , coal-tar naphtha, turpentine oil, etc., or their mixt., then painted with a rubber soln. to a suitable thickness and vulcanized.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

**A method for the measurement of resistance to tear in vulcanized rubber.** H. C. ZIMMERMAN. *Rubber Age* 12, 130-2(1922).—The resistance to tear is measured in terms of the work done in tearing a longitudinal slit in the center of a rectangular slab by means of hooks pulling transverse to the slab against the sides of the slit. Work is done both in tearing and stretching and by resolving the total force into 2 components; it is calcd. that  $W = (Ka - [(Fe)/2]/Lt)$ , where  $W$  = work in in.-lbs. to tear a slit 1 in. long in a slab 1 in. thick,  $a$  = area in sq. in. under the stress curve,  $L$  = length of torn slit in in.,  $t$  = thickness of slab in in.,  $F$  = final force in lbs. where tearing is complete,  $e$  = elongation in in. and  $K$  = a const. depending on the machine. With rubber-S compds. max. resistance to tear corresponds closely to optimum cure and occurs before the max. tensile strength is reached. With highly compounded stocks, the resistance varies greatly, depending on the particular fillers, their % vol. and the cure. For all mineral fillers, the resistance decreases as their % vol. increases. Based on % vol. of ZnO, the resistance first (0-7%) decreases with no difference along or across the grain, second (7-18%) increases, with higher values across than along the grain and third (18-22.6%) decreases along, and increases across the grain. Great differences in resistance occur with various grades of ZnO. The resistance of highly compounded stocks is influenced much less by the length of cure than that of rubber-S mixts. [cf. following abstracts].

C. C. DAVIS

**Resistance to tear.** J. B. TUTTLE. *India Rubber World* 67, 150(1922).—A new method is given for detg. the resistance of rubber compds. to tear, whereby tearing is measured in terms of elongation in distinction to its measurement in terms of the const. stress applied, as in the method of Zimmerman (cf. preceding abstr.). The resistance is measured by elongating to the breaking point a uniform strip having several transverse slits on one edge, and is expressed in terms of % increase in elongation at break. On this basis, the resistance to tear of inner tube compds. is independent of ultimate

elongation, tensile strength or the compds. present, but is influenced by any grain developed during calendering. C. C. DAVIS

**The resistance to tearing of rubber.** I. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* 20, 11, 733-5(1923).—A description of methods recently developed by Tuttle, Zimmerman, and Evans (cf. C. A. 17, 1903 and preceding abstracts), for detg. the resistance to tearing of rubber. In this first article, the method of Zimmerman is discussed. C. C. DAVIS

**Recent developments in rubber research.** H. W. GREIDER. *India Rubber Rev.* 23, 501-2, 506(1923).—The development of tearing tests is described. C. C. D.

**Rubber coagulated with sodium silicofluoride, hydrofluosilicic acid, its salts and bifluorides.** H. P. STEVENS. *Bull. Rubber Growers' Assocn.* 5, 170-2(1923); cf. C. A. 16, 2621.—Rubber prep'd. by  $\text{Na}_2\text{SiF}_6$  is of satisfactory quality; in a pure gum mixt. it cures slightly slower than rubber prep'd. by  $\text{AcOH}$ , but behaves like the latter on aging. Rubber coagulated with  $\text{HF}$ , with its  $\text{Pb}$ ,  $\text{Zn}$ , and the  $\text{Mg}$  salts, with  $\text{Na}$ ,  $\text{NH}_4$ , and  $\text{K}$  bifluorides, vulcanizes satisfactorily in a rubber-S mixt. G. S. W.

**Effect of variations in the sulfur and hexamethylenetetramine content on properties of compounded rubber.** H. A. DEWE. *Ind. Eng. Chem.* 15, 512-3(1923).—Data are given showing the effects in the basic mixt. (by wt.): pale crepe 920,  $\text{ZnO}$  560, C black 34, of varying the S from 10 to 4 and hexamethylenetetramine from 0.5 to 2.2. Overcuring has the greatest influence in causing rapid deterioration. Compds. with low S are less affected by overcure than those with high S. At the optimum cure, the rate of deterioration is nearly independent of the amt. of S or of accelerator. C. C. DAVIS

**Variability of rubber. Effect of organic accelerators.** G. MARTIN AND W. S. DAVEY. *J. Soc. Chem. Ind.* 42, 98-106T(1923).—When cured in the mixt. 90 rubber: 10 S: 2 $\text{PbO}$ : 1 light calcined magnes.: 1  $(\text{CH}_3)_3\text{N}$ , 8 samples of rubber all showed discontinuity of the type described by Twiss and Howson (C. A. 14, 3821). In this mixt. there appears to be no relation between S coeff. and tensile properties. The samples, which vary in a pure gum mixt., also show variation in the mixt. quoted. 9 samples compared in the mixt. (A) 90 rubber: 10 S: 5  $\text{ZnO}$ : 1 thiocarbamide showed variation. The av. deviation from the mean time of cure required to give max. tensile strength was 17%, as compared with 26% found when the samples were compared in the mixt. 90 rubber: 10 S. As judged on the basis of the load at a fixed elongation, the variation in the accelerated mixt. was greater than that in the pure gum mixt. The variation among the samples in regard to max. tensile strength appeared to be greater in the accelerated than in the pure gum mixt. Two of the samples of rubber were further compared in mixts. made by substituting for the thiocarbamide in mixt. A  $\text{MeCH}(\text{OH})\text{NH}_2$ , *m*-, *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ ,  $\text{C}_6\text{H}_5\text{N.CS.SNH}_2$ ,  $\text{C}_6\text{H}_{10}$ , *p*- $\text{NO}_2\text{C}_6\text{H}_4\text{-NMe}_2$  in succession; and it was found that in every case the sample which gave the higher tensile strength and cured more rapidly in a pure gum mixt. behaved similarly in an accelerated mixt. Extn. of rubber samples with acetone entirely altered the relation found with unextracted samples in the mixt. A between the stiffness of the vulcanizates and their coeffs. of vulcanization. Increasing the amt. of accelerator in mixt. A reduced the difference between two samples of rubber in regard to the time required to attain max. tensile strength and to the rate of combination of rubber and S. Increasing to 90 parts the amt. of  $\text{ZnO}$  in mixt. A or in the corresponding mixts. with the other accelerators already mentioned had the effect in all cases except that of  $\text{MeCH}(\text{OH})\text{NH}_2$  of reducing to an amt. which was very small as compared with that found in a pure gum mixt. the difference between the two samples in regard to the rate of cure and to the S coeff. corresponding to a given state of cure. G. S. WHITBY

**Properties and utilization of rubber latex.** H. P. STEVENS. *India Rubber J.* 65, 571-5(1923).—An address. G. S. W.

**Some theories regarding the action of accelerators during vulcanization.** F. THOMAS. *India Rubber J.* 65, 531-4(1923).—A review. G. S. W.

**Vulcanizing properties of preserved latex.** H. P. STEVENS. *Bull. Rubber Growers' Assocn.* 5, 168-170(1923).—Rubber coagulated by  $\text{AcOH}$ , from 4 samples of latex which had been preserved by the addn. of  $\text{NaOH}$  together with certain coal-tar products, behaved normally on vulcanization in a 9:1 rubber-S mixt. There is no evidence that the use of  $\text{NaOH}$  for the preservation of latex has a deleterious effect on the rubber prep'd. from such latex by coagulation or by evapn. Extn. of the water-sol. substances from a sample of sprayed rubber exam'd. previously (C. A. 17, 1349) greatly reduced the rate of cure (time of cure: 288 mins.) and also reduced the max. tensile strength. Similar extn. of ordinary crepe rubber has no such effect. G. S. WHITBY

**Some notes on calender grain.** R. W. LUNN. *India Rubber J.* 65, 565-6(1923).



cf. C. A. 17, 1903.—A study of the influence of temp. on the rate of retraction in the direction of the grain for a rubber-S mixt. calendered at 155° F. and subsequently chilled so that all grain was retained. The rate of retraction (1) increased rapidly with increase in temp., (2) decreased progressively as actual retraction took place and (3) was high at first and subsequently very slow for a given temp. The data, with the results of Weigand and Braendle (cf. C. A. 17, 1903), indicate that the grain in a cured compd. due to the rubber phase is influenced by (1) the spatial freedom of movement during cure, (2) the rate of vulcanization and (3) the amt. of retraction occurring before the latter is prevented by vulcanization.

C. C. DAVIS

**The resilient energy and abrasion resistance of vulcanized rubber.** H. W. GREIDER. *Ind. Eng. Chem.* 15, 504-11 (1923).—An extensive study of the effects of gas black (A), light MgCO<sub>3</sub> (B), china clay (C), ZnO (D), colloidal BaSO<sub>4</sub> (E) and lithopone (F) on the abrasion resistance of rubber. To the mixt.: pale crepe 50, smoked sheets 50, S 5, hexamethylenetetramine 1, ZnO 5 were added 0-30 vols. of A, B, C, D, E, or F, and the tensile strength, ultimate elongation, hardness, total resilient energy and rigidity detd. For the vol. of pigment giving the max. value, the tensile strength, resilient energy, abrasion resistance and hardness all decreased in the order: A, B, C, D, E and F. No tensile strength higher than the basic mixt. was obtained with E and F. Max. abrasion resistance was obtained with A 20 vols., B 6-8, C 9, D 10. E and F lessened the resistance of the basic mixt., indicating that when adhesion is low, small particle size is of no advantage. Neither tensile strength and abrasion resistance, nor resilient energy and abrasion resistance were proportional, and no relation was found between tensile product and abrasion resistance. Resilient energy alone was an unreliable index of the wearing properties, but the abrasion resistance at the point of max. reinforcement and the product of resilient energy and hardness were, however, approx. proportional. Wiegand's classification of pigments in 2 groups (cf. C. A. 14, 2732) can be amplified by dividing reinforcing pigments into (1) those giving great rigidity, high resilient energy and high tensile strength (A, lampblack, B, and C) and (2) those giving less rigidity and resilient energy but high extensibility (D, glue, E and coarse clays). All results are shown graphically and abraded surfaces photographed.

C. C. DAVIS

**Water dispersions from rubber, balata and gutta-percha.** III. J. B. TURYLE. *India Rubber World* 68, 488-90; cf. C. A. 17, 900, 1350.—Typical conditions for obtaining rubber dispersions in H<sub>2</sub>O are described. To a C<sub>6</sub>H<sub>6</sub> cement of broken-down rubber contg. oleic acid (5% or less of the rubber) is added, with agitation, dil. NH<sub>4</sub>OH until a reversal of phase occurs. The H<sub>2</sub>O, at first the dispersed phase, becomes the continuous phase and the C<sub>6</sub>H<sub>6</sub> rubber soln. splits into small globules. A slight excess of NH<sub>4</sub>OH should be added. The C<sub>6</sub>H<sub>6</sub> is distd. off and recovered, after which the excess NH<sub>4</sub> oleate is removed mechanically, leaving a thick paste contg. 50-60% rubber with only a trace of soap. This paste can be dild. without coagulation. The concn. of the rubber cement used for dispersion can be varied over a wide range. Rubber coagulated after dispersion contains approx. the same Me<sub>2</sub>CO ext. and protein as the original rubber. Either the non-rubber substances are (1) dissolved in, or intimately attached to, the rubber and are dispersed in the same globule or (2) sep. from the rubber and independently dispersed. The second is the more probable, indicating that org. substances other than rubber can be dispersed. To duplicate natural latex, natural serum, sugars, albumins, etc., must be added to this dispersed rubber to make a true artificial or synthetic latex. Dispersions of acid- and alkali-reclaimed rubber have also been obtained. Dispersed rubber compds. spread on fabric and cured in plied form gave higher friction tests than the same compd. after calendering.

C. C. DAVIS

**The value of rubber pigments.** I. D. F. TWISS. *India Rubber J.* 65, 607-10 (1923).—A review with new data on the value of  $n$  for rubber. With an Abbé refractometer  $n_D^{25}$  was 1.525 for pale crepe. Pigments with  $n$  values below 1.6 are of little value for coloring rubber.

C. C. DAVIS

**Artificial rubber latexes.** CAMILLO PELIZZOLA. *Giorn. chim. ind. applicata* 5, 76-7 (1923).—Review and discussion of recent work.

ROBERT S. POSMONTIER

**Paint for rubber** (Japan. pat. 41,141) 26. **Leather coated with rubber** (Japan. pat. 41,025) 29.

**Vulcanization accelerator.** P. I. MURRILL. U. S. 1,453,515, May 1. Dimethylamine is condensed with CS<sub>2</sub> and the product is pptd. with an aq. soln. of ZnSO<sub>4</sub> and the resulting insol. Zn compd. is oxidized by I, Br, Cl, or other reagent to obtain a vulcanization accelerator.

